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ALASKA AGRICULTURAL EXPERIMENT STATIONS.

C. C. GEORGESON, Special Agent in Charge.

ANNUAL REPORT

OF

ALASKA AGRICULTURAL
EXPERIMENT STATIONS

FOR

1909.

UNDER THE SUPERVISION OF
OFFICE OF EXPERIMENT STATIONS,
U. S. DEPARTMENT OF AGRICULTURE.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.

1910.

**ALASKA AGRICULTURAL EXPERIMENT STATIONS, SITKA,
RAMPART, FAIRBANKS, AND KODIAK.**

[Under the supervision of A. C. TRUE, Director of the Office of Experiment Stations, United States Department of Agriculture.]

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(2)

LETTER OF TRANSMITTAL.

SITKA, ALASKA, February 1, 1910.

SIR: I have the honor to submit herewith a report on the work of the Alaska Agricultural Experiment Stations for the year 1909.

Respectfully,

C. C. GEORGESON,

Special Agent in Charge of Alaska Investigations.

Dr. A. C. TRUE,

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Publication recommended.

A. C. TRUE, *Director.*

Publication authorized.

JAMES WILSON, *Secretary of Agriculture.*

(3)

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ANNUAL REPORT OF ALASKA AGRICULTURAL EXPERIMENT STATIONS FOR 1909.

SUMMARY OF WORK FOR THE SEASON.

By C. C. GEORGESON, *Special Agent in Charge.*

CLIMATIC CONDITIONS.

The weather must always receive first consideration in treating of any agricultural subject in Alaska. Success in agriculture and gardening depends on the weather. When the rainfall is light, the summers warm, with many bright days, satisfactory crops can be raised. When the summers are cold and wet, with little sunshine, these conditions are reflected in the growth of the crops. From the standpoint of the farmer and gardener the season of 1909 was unfavorable in the whole coast region. The rainfall was heavy, the summer cool, and the amount of sunshine small. The season may be reckoned from May 1 until September 30, although planting usually does not begin until the middle of May. During May there were at Sitka but 6 clear days, 8 days partly cloudy, 17 cloudy, and it rained on 17 days. During June there were but 8 clear days, 3 partly cloudy, 19 entirely cloudy days, and it rained on 16 days. The maximum temperature for the season was attained in June, viz, 76° F. July, which is usually the warmest month, was cool. The maximum temperature reached was 67°. There was not a single clear day in the month, and only 4 days on which the sun was seen, and 5.11 inches of rain fell on 24 days. The maximum temperature reached in August was 66°, with not a single clear day. The sun was seen only on 6 days, and 5.62 inches of rain fell on 25 days during the month. In September there were 4 clear days, 2 partly cloudy days, and 16.98 inches of rain fell on 25 days. Out of 153 days in this period it rained on 107 days, and there were only 18 days which could be classed as clear. These details are given because the results of the stations' operations must be judged in the light of these conditions.

In the interior the season was better than in the coast region, but even there the great proportion of cloudy weather and lack of sunshine prevented the best results. During the same period, from May 1 to September 30, there were at Rampart 45 clear days, 26 partly cloudy

days, and 82 cloudy days, while it rained on 37 days. The maximum temperatures reached at Rampart Station were: In May 76°, in June 83°, in July 90°, in August 89°, and in September 70°. While all the grain crops did well, as hereafter noted, they would have developed better and matured still earlier had there been fewer overcast days.

At Fairbanks Station there were, 77 clear days during the same period and only 76 cloudy and partly cloudy days, and of these rain fell on 50 days, which means that there were a great many showers.

WORK AT THE SITKA STATION.

FRUIT TREES AND NURSERY.

In a small test orchard some 46 varieties of apples are being grown. In the case of many of these the trees are too young to bear any fruit, but in some cases the trees would have borne fruit had they been grown under more congenial conditions. A few varieties have shown blooms during the last two or three years, but have set no fruit. The winter of 1908-9 was quite severe for this part of the coast region. The temperature fell to 2° above zero and 3° above zero in January and February, respectively, and the cold period was protracted over many weeks. As a consequence, the young growth produced in the season of 1908 was partly killed in most cases, and in some cases entirely. This, of course, set the trees back, and none of them can be said to have done well. The details of the growth of each variety are given in the notes by Mr. R. W. De Armond.

The results of the experiments with fruit trees to date are not very encouraging. It begins to appear very doubtful if apples of the existing varieties can be grown in Alaska and brought to maturity. It would seem that if apples are ever to succeed in Alaska they will have to be developed from hybrids with the native Alaska crab apple (*Pyrus rivularis*). As has been mentioned in former reports, more particularly in the report for 1906, this wild species is found throughout the coast region of Alaska, and produces clusters of very small apples. These apples mature in early October. If hybrids of this species can be secured, it may be possible to develop varieties which can prosper in the wet, cool summers peculiar to the coast, and mature fruit before frost, and by selection from the best of these to obtain apples large enough to be useful. The varieties growing at this station which contain crab blood are hardier and more promising than varieties with no crab in them. This would indicate that the crab varieties should be selected in cross-fertilizing the native crab. It is a long and laborious process. It will require many years to get results, but there is every reason to hope for success if one labors systematically and persistently. It is proper work for the experiment stations, and efforts in that direction will be continued.

In the nursery several hundred apple grafts are being grown, with a view to using them for these tests when they become large enough, and some of them will also be used for tests by settlers and at the interior experiment stations. It is hoped that with the advent of railways into the interior it will be possible to send nursery stock into that region in time for planting in the spring. Under present conditions this can not be done. Packages are not carried until river navigation opens, usually in June, and by the time a package of nursery stock reaches its destination it has been reduced to a bundle of dry sticks. Hundreds of packages of live fruit bushes and small fruit trees have been sent into the interior from this station during the past few years and very few have lived. Even if sent by express during the winter season live trees would be so exposed to severe cold in transit that they would be dead on arrival. For these reasons it has not been possible so far to experiment with fruit trees at the Rampart Station.

Currants, gooseberries, and raspberries were propagated the past season by cuttings, layers, and division, and the station has now a goodly number of young plants for experiment and distribution. Mr. De Armond gives the details of this work in his notes.

FRUIT BUSHES.

If there is doubt about the success of tree fruits, there is none whatever about bush fruits. Currants and gooseberries do as well here as anywhere on earth; in fact, the currant is indigenous to Alaska and is found both in the coast region and in the interior. A number of varieties of currants are being grown and propagated for tests elsewhere. It is a question whether the cultivated sorts will be hardy in the interior, but on the coast they do very well. The native currants, both red and black, from different sections of the coast region are being grown, but it has been found that they do not transplant easily. When removed from their native environment and placed under new conditions they often die, or if they survive it frequently takes them several years to become established. The native currant matures its fruit earlier than any of the cultivated varieties tried, but the berries are more acid than the cultivated sorts and also more irregular in size and shape, and they do not bear so well. Seedlings of the native currant from the interior are being grown, with a view to testing them for cultivation. Their growth is slow but vigorous. Peculiarly enough, the native species, as grown at the station, appear to be more susceptible to fungus attacks than the cultivated varieties.

Gooseberries do extremely well in this climate. A few varieties are being grown, some of which are imported English sorts. Owing to the fact that they do not make roots readily from cuttings, they are

not so easily propagated as the currant, and they have therefore not been distributed to settlers. For some years the seed of these gooseberries has been saved and some seedlings are being raised. A wild species of the gooseberry is found in the Coast Range. It has a small, black, hairy berry, which grows in racemes, in that respect resembling currants, but in all other respects it is like the gooseberry. Seedlings from this species are also being raised, and an attempt will be made to hybridize them with some of the cultivated sorts.

Raspberries also do very well in the coast region, but the cultivated varieties are too tender to stand the winters of the interior. The raspberry is indigenous to Alaska as far north as the Arctic Circle, and probably even beyond. They are abundant in places in the hills around Rampart and Fairbanks. In those situations the plant is very small, rarely more than 2 feet high and often much less. They prefer open groves of timber. After a forest fire the raspberry frequently comes in and occupies the ground more or less densely until again crowded out by new forestation. They are not much of a success under culture. Like the wild strawberry, they respond to good treatment in the development of shoots and leaves, but produce but little fruit. To cause them to fruit, they must not be fertilized, and they must be grown under conditions where they have more or less of a struggle for existence. The interior wild species is not found in the coast region, and can not be grown with any success in the moist, spongy, peaty soil peculiar to the coast. No success has as yet been met with in cross-fertilizing the cultivated sorts with pollen from the interior native variety.

The salmon berry is a species of *Rubus* indigenous to the Alaska coast. It is not a raspberry, but closely related to it. It has a large, edible berry, which, however, lacks the peculiar raspberry flavor; it is very soft and would not bear shipment. Cultivated varieties have been hybridized with this species and have produced a large number of plants, some of which are 3 or 4 feet high, but for some reason they do not fruit. They will bloom sparingly, but have so far not produced any fruit. Efforts in this line will, however, be continued.

Blackberries and dewberries can not be successfully grown in any part of Alaska. They have been tried repeatedly at the Sitka Experiment Station and the attempt has always resulted in failure. The summer is not warm enough to develop the fruit and the plants usually winterkill even in mild winters, probably due to the late, succulent growth resulting from the abundance of moisture. The station has under culture a number of bushes of the service berry (*Amelanchier canadensis*). They stand the climate well; the bushes bloom profusely, but they set very little fruit, and the fruit which they do produce is small and almost worthless. Attempts have been made for several years to grow the buffalo berry of the northwestern prairies, but without result; no fruit has been produced.

POTATOES AND OTHER VEGETABLES.

Vegetables of all kinds were only a moderate success in the coast region the past season. There was too much rain and a lack of sunshine. Potatoes did relatively better than cabbage and cauliflower. These two latter crops were poor, partly by reason of unfavorable weather and partly on account of the root maggots, which have become very destructive in this region. So far no efficient remedy against them has been found. Carrots, turnips, beets, and mangels were only a moderate success. The turnips grew and yielded relatively better than the other root crops. Early radishes were a success, and lettuce also grew well. Small samples of barley and oats kindly sent to the station by Mr. Erhard Fredericksen from Denmark did not mature before frost, chiefly because the wet weather kept them growing until late in the fall.

HYBRID STRAWBERRIES.

The hybridization of strawberries, which has been mentioned in several reports, has finally culminated in fruit. This experiment has proved a decided success.

It was found after several years' trial with popular varieties of cultivated strawberries that they were at best only a partial success in this climate. Sometimes they survived the winter and sometimes not. They did not fruit well and the berries were apt to be misshaped, small, and few in number. It was to develop plants better suited to the climatic conditions that this experiment was undertaken. It consisted in pollinating several cultivated varieties with pollen from the native wild species. This species and the process of pollination was described in some detail in the report for 1906. Some five or six years ago the station procured 150 plants of the wild berry indigenous to the Alaska coast about the Bay of Yakutat, and it has therefore sometimes been referred to as the Yakutat strawberry and sometimes it is referred to in previous reports as the native. The species is known as *Fragaria chiloensis*. It grows along the coast from Muir Glacier to Prince William Sound and probably also in other places, but throughout this region it is quite abundant. Its favorite soil is the sand and gravel along the old beach line just above the reach of high water. It here disputes the possession of the surface with grasses and weeds of many kinds and is quite able to hold its own against them. In this situation it is a low spreading plant with many of the leaves flattened out against the surface of the ground. It sends out numerous runners. One peculiarity of the species is that a large percentage of the leaves have four leaflets, a characteristic believed to be rare in all cultivated varieties. It has a large white flower. Some of the peduncles are upright and hold the

flower aloft. These seldom produce fruit. The fertile flowers are for the most part borne on slender, recumbent peduncles. When the fruit is set, these fruiting peduncles are usually out of sight, buried by weeds and grass surrounding the plant, and the berry rests on the ground, where it develops and ripens. Owing, perhaps, to the shade in which it grows, the berry remains white until it is ripe, when it turns to a light red color. The ripe seeds are prominent, brown or black in color, and quite large. The ripe berry is remarkable for three very desirable qualities: It has a most delicious flavor; it has a noticeably strong aroma; and it is very firm, so that it can be handled and shipped considerable distances without injury. It will average the size of the end of a man's little finger. Some are larger, even to the size of large thimbles; others are smaller. The general shape of the berries is conical with slight variations therefrom. The plant does not grow at Sitka, nor on Baranoff or adjoining islands, as far as the writer knows. It was necessary, therefore, to procure them from the region above mentioned.

When first received these plants were set out in good garden soil. This proved to be a mistake. They grew most luxuriously, some of the leaves standing a foot high. They sent out enormous numbers of runners, and in a short time made a dense mat of plants over the entire bed, but produced no fruit; they produced only a few blossoms and not one of these produced a berry. The plants reveled in the unwonted amount of plant food and apparently had no incentive to fruit. The bed was next transferred to the poorest piece of soil that could be found on the station, namely, a knoll of red volcanic ash from which the surface had been scraped away by the leveling of the ground. This soil is almost sterile, but these wild strawberries grew and prospered. The plants became low and spreading as on their native sandy beaches. They bloomed profusely and produced considerable fruit. This is the plant which was chosen as the male parent in the hybridizing experiments, in the hope that the resulting progeny might retain the hardiness and the quality of berry of the wild plant and at the same time develop the productiveness and size of berry of the mother plant. In a large measure these expectations have been fulfilled. Unfortunately it is impossible to name the variety of the mother plant. After importing and testing and finally discarding between forty and fifty popular cultivated sorts some plants were obtained from Mrs. Helen Althouse, of Hollis, Alaska, who reported that she had a variety of strawberries which had proved fairly satisfactory, but she did not know the name of the variety. She had obtained the plants from some friend on Puget Sound, and was of the opinion that they had originally come from Michigan, but knew nothing more about them. The writer will not presume to determine this variety. It is a fairly good strawberry of

medium size, that is to say, as large as the end of a man's thumb, generally conical in shape, light red in color, and of fairly good flavor. This variety has proved hardier at the Sitka Station than other varieties tried, and hence it was used as the mother parent. It was found to bloom about three weeks later than the native species above described, and in order to have the two plants bloom at the same time, this cultivated sort, which for the sake of convenience we have given the name "Hollis," from the little settlement at which it was grown by Mrs. Althouse, was therefore planted in boxes and put in the greenhouse so as to forward the blossoming and also to better control the cross-fertilization. This part of the work proved a success. The plants grew well under glass and bloomed freely at about the same time the wild plant bloomed. The blossoms were watched, the anthers removed, and the pistils artificially pollinated with pollen from the wild flowers as soon as they were ready. The resulting seed was sown in flats and the plants were kept in the greenhouse or in cold frames, and when large enough planted in the open. The plants required from two to three years in coming to maturity, and this is the first year that they have borne fruit. It became evident early in the summer that they would bloom profusely and as soon as blossom buds were visible the plants were numbered. Among more than 2,000 plants which were under observation 1,288 were found that would bloom, and these were numbered from 1 up.

These hybrid seedlings proved to be remarkable in several respects. In the first place they are much more vigorous than either of the parents. The peduncles are long and the leaves broad. On a certain patch of well fertilized ground the plants would average about 14 inches in height. The peduncles were also correspondingly large and stout. By actual measurement some of them reached a height of 18 inches, but as in the wild plants these tall flower stalks usually produced no fruit. The fruiting peduncles were shorter and procumbent.

Another peculiarity which has evidently been inherited from the wild plant is that a large percentage of these hybrids show leaves with four leaflets, but as might be expected there is great variation in their appearance and vigor. Some plants have broad, vigorous leaves, and others much smaller, slenderer, and more pointed leaves. Some have smooth, glossy upper surfaces, others rough upper surfaces. As the berries approached maturity it became evident that many of the plants would produce fruit as large as or larger than that of the mother variety, and in addition they nearly all inherited the very desirable qualities of fine flavor, high aroma, and firmness of berry which characterize the wild plant. The summer was rainy, with but little sunshine, as heretofore noted. For this reason many of the berries rotted before they matured and therefore could not be judged.

Another untoward circumstance was that the ravens, which are a veritable curse at this station, discovered the berries and pulled them off. They did not eat them, but they have an insatiable desire to destroy anything they believe useful to man, and the various patches of plants had to be guarded almost constantly with a shotgun to keep them off. The robins likewise discovered the berries and soon developed a fondness for them, and they, too, became a destructive agent. Moreover, it was impossible to get them photographed when each plant had its berries at the proper stage, and therefore many berries were larger and better than those shown in Plates I and II. The clusters of berries here shown are much reduced, and in the absence of an object of known size to compare the berries with in the illustration, the photographs are not very satisfactory. However, they show the peculiarly long peduncles which seem to be a characteristic of all these hybrids. They show the large calyx that the berries have. The number of berries on the cluster shows that the plant was productive and the general conical shape of the berry, which seems likewise to be a characteristic of nearly all the hybrids, is noticeable. The single berries shown in Plate III were photographed on cards which were ruled off in inch squares, and it is therefore possible to get a fairly correct idea of the size of the berry in each case. These are but a few samples of the berries gathered from about a hundred plants which were deemed to be of sufficient merit to be further tested. The berries here shown were not photographed at their best, having been kept in dilute alcohol for three months. They show enough, however, to prove that they are worthy of careful testing hereafter, in the hope that they will be found to possess the hardiness and productiveness which are desired.

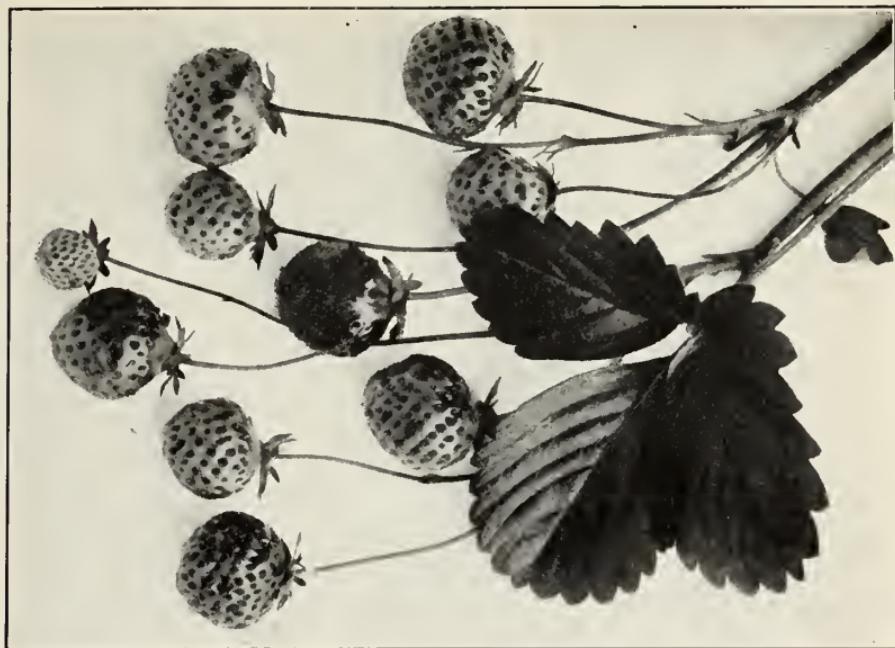
WORK AT THE RAMPART STATION.

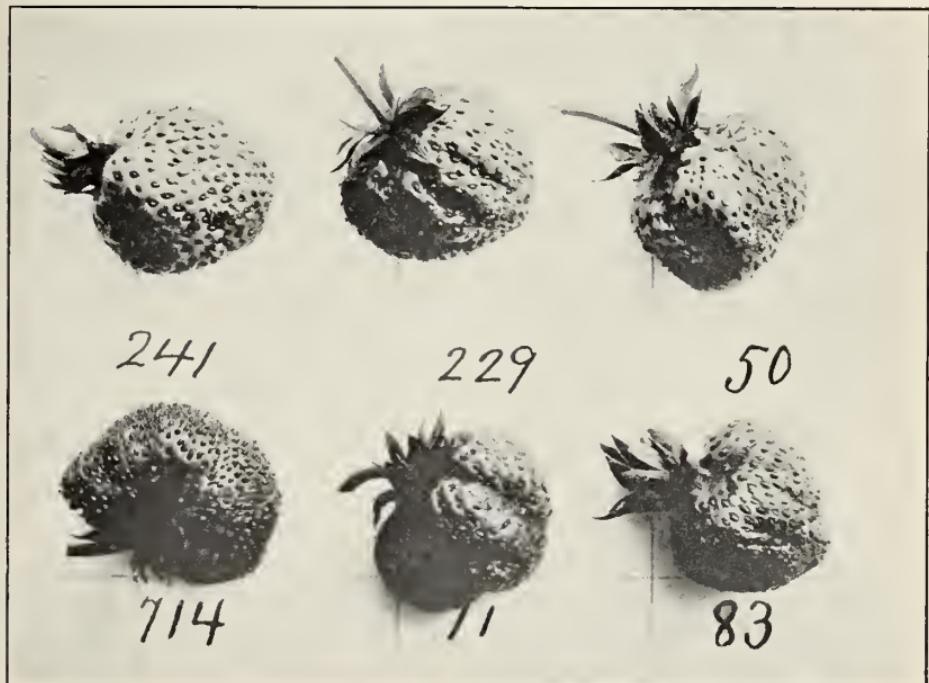
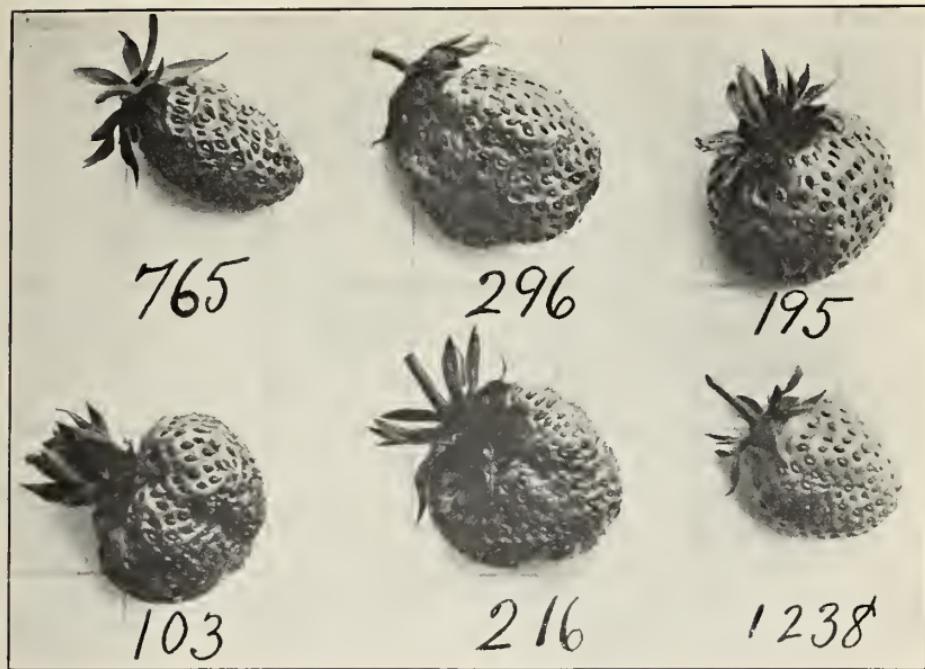
It is a great satisfaction to be able again to report the work at Rampart Station an unqualified success. Fifty-five varieties of cereals matured at this station the past summer, comprising 4 varieties of winter wheat, 7 varieties of winter rye, 29 varieties of spring barley, 15 varieties of spring oats, 1 variety of spring wheat, 1 variety of spring emmer, and 1 variety of spring rye. Black winter emmer was winterkilled, also 3 varieties of winter barley, and 1 variety of winter oats. These would probably have lived through the winter had the snowfall been deeper where the plats were situated so as to give them better protection. Three varieties of spring wheat, i. e., Ghirka, G. I. No. 1517, Romanow, raised from seed grown at the station in 1908, and Wild Goose from Brandon, Manitoba, failed to mature, but Red Fife from Brandon, Manitoba, on the other hand, matured before killing frost. Two varieties of buckwheat, one of Russian origin raised from seed matured at the station in 1908,



TWO TYPES OF HYBRID STRAWBERRY PLANTS, HOLLIS X NATIVE SPECIES.

TWO TYPES OF FRUITING CLUSTERS OF HYBRID STRAWBERRIES, HOLLIS X NATIVE SPECIES.





TYPES OF STRAWBERRY HYBRIDS, HOLLIS X NATIVE SPECIES.

and one without name, but probably "Silver Hull," obtained from Brandon, Manitoba, were killed by the slight frost which occurred on August 24, at which time only a small percentage of the seed was ripe enough to grow. But these are small losses compared with the great number of varieties which matured perfectly. It is becoming apparent that the suitable grain crops will be barley, oats, and winter rye, which are staple crops in the northern European countries. Hardy early winter wheats can be grown to a limited extent, but it is doubtful if wheat, either of the winter or spring varieties, will be a paying crop. The wheat plant, as represented in the varieties at this station, is too sensitive to severe cold, and requires a longer and warmer season in which to mature than is afforded by the average season in this latitude. Winter rye is a hardier plant, although it, too, will be winterkilled if not protected by about $2\frac{1}{2}$ feet of snow. In 1908 winter barley survived under a good covering of snow, but it is not to be expected that the so-called winter varieties of barley and oats can always be depended on to survive the winters in Alaska when they are frequently winterkilled as far south as Tennessee. It is only in occasional seasons that these winter grains will survive and mature a crop, which was to be expected. Winter rye is hardier than wheat and will succeed in many seasons when wheat will fail in whole or in part, but winter rye will probably succeed better than spring rye for the reason that the latter requires a longer season in which to mature. In the course of time, however, there is no doubt but that the season for ripening spring rye can be shortened, and that a hardier winter rye will be found—that is to say, varieties of these crops can undoubtedly be developed which will be suited to the climate. The same is probably also true of both winter and spring wheat, though the problem is in that case less certain of solution.

But the experiments have demonstrated beyond doubt that barley and oats of many varieties can be grown with certainty over a very large area in the interior of Alaska, in regions not liable to summer frosts. There are belts which are exempt from this scourge of the grain grower. There are other belts in which summer frosts are the rule and their absence the exception. Just where the boundaries of these belts are can only be learned by experience. The Rampart Experiment Station is located on rolling land among the low hills, and here summer frosts are the exception. The past season slight frosts occurred on the nights of August 24 and 25. These frosts were sufficient to slightly brown buckwheat, potato vines, and similar tender plants, but not sufficient to injure grain crops. Low-lying ground or large open flats are more liable to summer frosts than higher and rolling ground, a fact so well known that it scarcely needs to be pointed out here.

EARLY SEEDING FOUND NECESSARY.

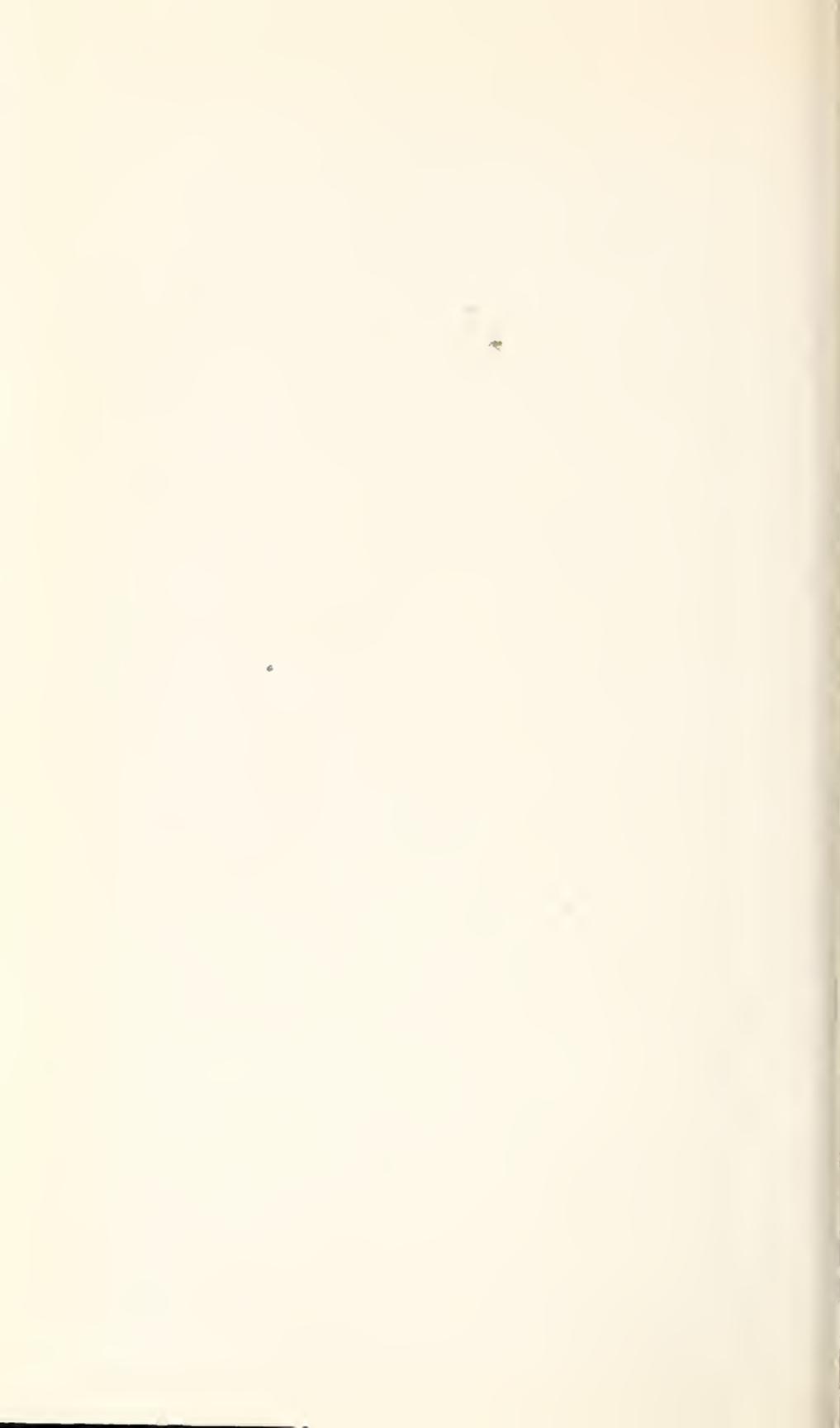
These 47 varieties of spring grain matured in spite of the fact that the first seeding did not take place until May 18 and seeding was not finished until June 1. If it were possible to begin seeding earlier there would be still greater certainty of maturing the crops. A certain number of days, which vary with the variety, is required for the development and maturing of every grain. If seeding is late the period of growth of necessity must be extended into the early fall. If seeding can begin in early May there will be a gain in time, and therefore greater certainty that the crop will mature before frost. How to accomplish this is the problem. It depends chiefly on the length of time the snow remains on the ground, and after the snow melts some days are required for the ground to thaw and dry sufficiently to be worked. It is here that nature can be helped. If the ground is fall plowed and left in the rough, and if the lands are made narrow with open furrows directed up and down the slope, this will facilitate the drainage of the surface water and therefore hasten the drying of the ground. Grain growers in Alaska are following this practice. Ground left in that condition will dry out rapidly and spring plowing is unnecessary. Go over it once with a disk harrow, or if a disk harrow is not available an ordinary smoothing harrow will answer, and follow this with the grain drill. The use of a drill is recommended. A drill puts the seed into the ground at an even depth and distributes it evenly over the entire surface, which are two points of importance, and neither can be attained when the grain is broadcasted by hand. A shoe drill is preferred to a hoe drill for the reason that invariably many small roots are left in the ground. A shoe drill will pass over these, whereas a hoe drill will catch in them or drag them along.

When so many varieties are grown in a small area the plats are necessarily small (Pl. IV). They vary, however, in size with the amount of selected seed and the area of the land suitable for the tests. For the purpose of comparing varieties as to earliness, vigor of growth, ability to withstand storms, size of heads, and other qualities, small plats are better than large plats of a quarter of an acre or even one-tenth of an acre. They have the further advantage that ground can be selected of uniform quality so that all the plats shall be as nearly as possible under exactly the same conditions.

The earliest variety of barley grown at the station is known as Pamir, S. P. I. No. 18922, imported by the Department of Agriculture from the high tablelands of Pamir, central Asia. It was seeded May 19 and matured August 14, or in 87 days. Next to this in point of earliness is a variety imported by the Department from the neighborhood of Yakutsk, Siberia, and known as Yakutsk, G. I. No. 574.



EXPERIMENTAL PLATS, RAMPART STATION.



It matured in 88 days. A variety of oats from the same region—Yakutsk, G. I. No. 498—was seeded May 20 and was ripe August 17, and therefore matured in 89 days. The rest of these grown at the station the past season followed the lead of these, several of them maturing on about the same dates. One of the best barleys grown at the station is the Manshury, a variety well known throughout the northern tier of States. It was seeded May 19 and was also ripe by August 17. It is a tall growing, vigorous variety, with a stiff straw and large heads. The only objection to it is that it has long stiff beards. If the beards could be eliminated it would probably be the most desirable variety of barley so far known. While it is early and stands up well it is also a heavy yielder, but all bearded varieties are objectionable to use for feed in the sheaf. For this reason a beardless variety is desirable which shall possess the other desirable characteristics peculiar to the Manshury, i. e., stiff straw, large heads, plump grains, and earliness. Most of these qualities are found in Chittyna. This variety was found by Mr. C. W. H. Heideman, formerly superintendent of the Copper Valley Experiment Station, on his trip into northern Alaska in 1906. He found it growing in the garden of Judge F. B. Howard, at Coldfoot, Alaska, procured a few seeds, and grew them at the experiment station in the Copper River Valley in 1907 and 1908. In the absence of any knowledge as to its origin, and in view of its very promising characteristics which would make it useful for future experiments, it required a name, and he named it Chittyna. A couple of short rows of this variety were grown at the Rampart Station the past season. It was seeded May 21 and was ripe August 31. It grew to an average height of 45 inches. The heads are large, averaging 68 grains to the head; it is beardless, has a stiff, vigorous straw, and is in every way a desirable variety except that it lacks earliness. It is hoped that this variety may be the basis for the development of one or more sorts which shall be equally good as regards vigor and yield, but which will mature earlier. For this purpose several crosses have been made with other varieties. What the results will be remains to be learned.

CLEARING LAND.

The past season 6 acres were cleared at the Rampart Station and next year 22 acres will be under cultivation. This will be ample for the purpose of the breeding experiments, but not enough to furnish feed for the station team without encroaching upon the breeding ground. The clearing will therefore be continued, the plan being to add a few acres each year to the area under culture until the farm shall have an area of at least 50 acres. A farm of that size will be sufficient not only for the grain-breeding experiments, but for the

raising of feed and to illustrate the best methods necessary to follow for successful agriculture in that region. Clearing is slow and expensive work, labor costing \$6 a day for eight hours' work at that station. It is therefore necessary to reduce the hand labor to a minimum and to employ team work and machinery wherever possible. The stumps are not large; they will vary from 6 inches to 18 inches in diameter, the smaller ones being birch and the larger spruce. These are pulled quite expeditiously with a small stump puller operated by one horse. The roots do not go deep; they are all near the surface of the ground, but in pulling the stump over, the network of roots carry with them quite a large amount of earth. It is necessary to remove this earth by hand in order to facilitate the burning. The stumps are next rolled into piles and burned as soon as dry enough.

The whole surface of the ground, wherever there is any vegetation at all, is covered more or less thickly with a layer of moss. The lower the ground and the denser the vegetation the thicker is this layer of moss. It is absolutely necessary to destroy this moss by burning. It is a mistake to plow it under. It does not rot readily and it seems to contain substances which are inimical to the growth of agricultural plants. It has been found again and again that whenever this surface layer of moss is completely burned off, grain crops do well even the first year, but wherever it is plowed under or poorly burned grain crops are a failure, not only for the first year but for successive years until the moss is destroyed. A good illustration of this fact was seen at the Fairbanks Station the past season. A large area was cleared in 1908. But little brush or timber was on the ground and the brush piles were therefore not very close together. Between these piles the moss was simply turned under in the breaking. The result was that last year's oat crop on this land was extremely "spotted." Where the brush pile had been and as far out around it as the fire reached, the crop of oats was fine, but between the brush piles there was practically no crop at all, the oats attaining a height of 6 inches or a foot at most, and the heads consisting of three or four or half a dozen grains. Nor is this due altogether to the fertilizing power of the ashes, for it has been found that wherever the coat of moss is dry enough to burn thoroughly, even when there is but little brush to furnish ashes for fertilization, the crop does well. This point, too, was illustrated at the Rampart Station the past season. Between 8 and 9 acres were cleared in 1908. The early part of the summer season was very dry. The moss, therefore, dried out thoroughly and the whole surface was thoroughly burned. The result the past year was an excellent oat crop over the whole area, so uniform that one could seldom detect where the brush and

stump piles had been. The oats were grown for hay and seeded late, but they stood 5 feet high and yielded a heavy, uniform crop.

The same point as to the necessity of burning the moss has been emphasized by homesteaders in the Tanana Valley, who have made the same discovery.

The moss will, of course, burn more readily if it is torn up so that the wind has a chance to dry it. For this purpose Superintendent Gasser uses a plow which has been adapted to suit the conditions. He has a sidehill plow from which he has removed the moldboard, and bolted a piece of iron to the beam and the shoe in such a way that it answers the purpose of a coulter. Any plow from which the moldboard and share has been removed can be adapted to this work in the same manner. By pulling this through the coat of moss at intervals of about 2 feet and then cross-working it in the same manner the moss will be pretty thoroughly loosened, together with small bushes and roots in the surface. It can then be further loosened by working it over with a heavy harrow. For this purpose a home-made A harrow, is used, an implement which has been found almost indispensable in the pioneer work of the stations. After being thus loosened the moss will soon dry out so as to burn thoroughly and the ground can then be broken with the assurance that it will yield a good crop.

BUILDINGS NEEDED.

The only building at the Rampart Station aside from the neat little cottage is a log barn and shed with sod roof which affords but poor shelter for the implements. The station needs a granary in which to store the seed grain required and that which is preserved for seed of each season's crop. This will require considerable space. A frost-proof cellar for the root crops and an implement shed adequate to shelter the accumulated stock of tools are also needed, as well as a shop in which to do necessary carpenter and blacksmith work. It is hoped that money will be available from the appropriation for the next fiscal year for the purchase of the materials with which to construct these necessary buildings. The superintendent can do the work himself, assisted by such laborers as he can find, but the material must be purchased, and since there is no sawmill in the immediate neighborhood it may be necessary to ship the lumber either from Fairbanks or from Seattle, whichever may prove the cheaper point to purchase, considering freight. When these necessary buildings are once supplied, the station will be adequately equipped to handle the work which it has been planned to do there.

The writer visited the station the latter part of July. It was an unalloyed pleasure to note the excellent condition in which Superintendent Gasser keeps it. Scarcely a weed was to be seen; the work

had been done with care and skill. It had been done at the proper time and in the right manner, and the station can be said to reflect much credit upon the Department of Agriculture.

But little attention is given to vegetable growing at the Rampart Station. Nevertheless small patches of all the leading vegetable crops suited to that region are grown. Potatoes being the most important crop receive more attention than anything else. Some 33 varieties were grown there last summer, partly with a view to increasing the stock of seed of each, and partly to learn which of these varieties are best adapted to the climate. The season was not favorable to the potato crop. The spring was late and then followed a long dry and cool spell which delayed the sprouting and growth of the potatoes after they were planted. Consequently the season was short for the crop, and the slight frost which occurred on August 24 and 25 further delayed development of the tubers. Nevertheless most varieties did fairly well. Mr. Gasser gives a detailed account of the weight of the seed planted and the weight of the crop harvested of each kind. This work will be continued.

WORK AT THE FAIRBANKS STATION.

The Fairbanks Station is yet very much in the pioneer stage. The writer spent two weeks there last August. Superintendent Neal went there in the spring of 1908, when there was nothing whatever from which to make a farm except the land. He has worked hard and faithfully and the views herewith submitted, taken last August, show what has been accomplished (see p. 50). About 50 acres were cleared in the summer of 1908, but it was not all broken, cold weather coming on before the task was completed. This breaking was finished the past summer. A substantial log barn has been built. This, however, was not completed, the plan being to add to it so as to make it twice as large, but it serves present purposes. He built a little log cabin alongside of the one which was purchased and connected the two with a porch. He also cleared 4 acres of the birch land on the side of the hill immediately surrounding the buildings. As may be seen in the view submitted, the timber, though small, is very thick on the ground, and birch stumps have a large root system, so it takes time to handle them. As at Rampart we use a stump puller worked with one horse, which does good work. Since my visit in August Mr. Neal has built an addition to one of the cabins and dug a cellar under it 13 by 26 feet and 7 feet deep, which serves as a place to store potatoes and other root crops. About 30 acres were in crops last year, mostly oats raised for oat hay for the use of the teams, but also some experimental plats and about 3 acres of potatoes. The potatoes were not vigorous. The soil is new and the seed potatoes were made to go as far as possible. As at Rampart, some thirty varieties

are being tested in order to see which will do the best. It is a well-known fact that varieties of potatoes differ greatly in their power to adapt themselves to different soils and climates. The total crop amounted to 4 tons.

In the experimental plats two varieties of winter wheat matured, one a velvet chaff and the other the Romanow, which is a so-called spring wheat. The seed from which this latter variety was grown was raised at Tanana Hot Springs, the famous warm-land farm. It was seeded at Fairbanks as soon as received—September 1, 1908—and this so-called spring wheat lived through the winter and matured by September 1, 1909. Whenever the snowfall is sufficient to protect it from the extreme cold, it appears that winter wheat is much more likely to succeed in the interior of Alaska than is spring wheat. The season is rather short for spring-seeded grains. One variety of winter rye, S. P. I. No. 19556, matured perfectly. It was seeded August 15, 1908, and ripe August 19, 1909, but another variety of winter rye, S. P. I. No. 11268, was winterkilled completely. Tennessee winter barley, G. I. No. 386, came through the winter with a very poor stand, but that which survived matured by August 1. Winter emmer was a failure here as at Rampart. All the spring grains except those seeded for hay matured perfectly. Twelve varieties of oats were grown. Of these the Sixty Day oats proved to be the earliest. These were seeded May 22 and were ripe August 25, while several of the imported oats did not ripen until September 10. Six varieties of barley, all that were seeded, likewise matured, although one of the imported varieties, S. P. I. 19852, had not matured all of the heads when frost came. A variety obtained from Professor Hansen, of the South Dakota Experiment Station, No. 279, proved to be the earliest of the varieties tested at this station. It was seeded May 22 and ripe August 15.

Five varieties of spring wheat were tested, all of which failed to mature, except a few occasional heads which will be used for seed hereafter. On the other hand, two varieties of spring rye matured sufficiently to grow again, proving that rye is better adapted to that climate than wheat.

The pedigree seeds of barley and oats, which were raised by Superintendent Heideman of the Copper Center Station, were transferred to the Fairbanks Station along with the rest of the equipment. Unfortunately these seeds were lost, as they failed to mature. Superintendent Neal selected what he considered a warm, suitable soil for their culture and seeded them in May as soon as the ground was ready, but unfortunately the spring was very dry and the drought continued until June 26, and most of these seeds did not germinate until rain fell on that date. Consequently their start was too late to mature grain and they were all killed by the frost of September 16.

A few heads were mature enough to grow and a little seed was left over, so that we shall have enough for another small start in the continuation of the growing of these selected varieties. Buckwheat seeded May 23 was killed by a light frost on August 25. At Rampart red, white, and alsike clovers were completely winterkilled, but at Fairbanks alsike clover survived the winter. Red and white clovers were not tried. The reason for their being killed at Rampart and alsike surviving at Fairbanks is undoubtedly the difference in the protection afforded by the snowfall.

Some 30 acres were in oats in 1909, partly in Banner oats grown for seed, which matured (Pl. V, figs. 1 and 2), but mostly seeded with commercial feed oats for hay. In both cases the crop was light, it being the first crop on new land, and the moss was not dry enough or thick enough on the ground to burn well when the land was cleared.

PLANS FOR THE FUTURE.

It is planned to extend the clearing at the Fairbanks Experiment Station until several hundred acres are under culture, preferably about 500 acres, so that it will be possible to farm on a fairly large scale. This will give an opportunity to test the practicability of real farming in the Tanana Valley. After the pioneer work is done, it is planned to keep an account, with the expense of culture and the receipts from sales of crops, so that the data will be available for settlers in the future. The chief object of the work at this station is to determine whether or not farming can be made to pay. Some purely experimental crops will also be grown on a small scale, but this will be a side issue. The energies of the station during the next few years will be directed to the clearing of land, but the best soil is that which is most heavily timbered, and the expense of clearing this land is proportionately greater than is the clearing of land less desirable. Two low ridges, parallel with each other, and about a mile apart, extend from east to west across the station land. They afford two gentle south slopes, which, when cleared, will make ideal farm land, but most of these two slopes also have a heavy growth of birch timber with a liberal sprinkling of spruce. Much of the land between the ridges has a north slope running down into a marsh, and in the low ground there are two lakes, one about 5 acres and another about 25 acres in extent. This land when cleared of brush and "niggerheads" (the local name for a species of plant which grows in large tufts and eventually forms high hummocks) will make ideal meadow land. Some 50 acres of the land now cleared at the station is on this north slope because it could be cleared rapidly and at a comparatively small expense and it was necessary to get land under culture on which to grow feed. But as far as possible the clearing hereafter should be confined to the south slope of the first ridge, where

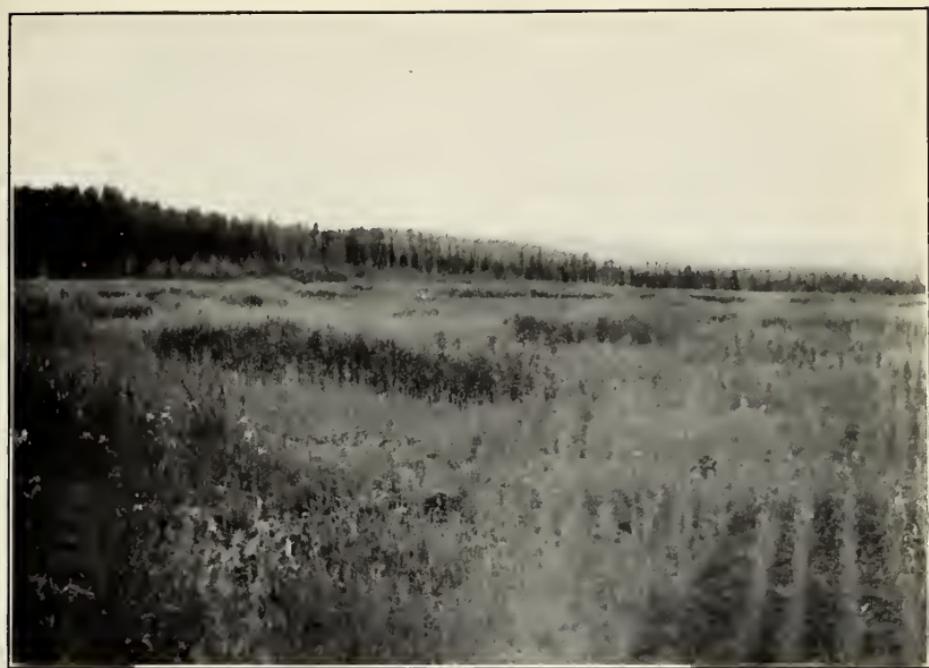


FIG. 1.—OAT FIELD MOSS PLOWED UNDER.



FIG. 2.—OAT FIELD, MOSS BURNED.



the buildings are located. It is near the railway station of the Tanana Valley Railway and is in every way the most desirable locality. But the cost of clearing this land will be a heavy item at the ruling rate of wages, \$7.50 a day for eight hours' work.

In the line of buildings the station needs an implement shed, a blacksmith shop, a granary and seed room, and the barn should be enlarged to meet the requirements of the station. Some of these buildings must be erected next summer. A dwelling for the superintendent is also needed, but this will now have to wait until the other structures are completed. Superintendent Neal is a conscientious and practical man. He has handled the work in the most economical and most effective way possible.

CLOSING OF THE COPPER CENTER STATION.

In accordance with the recommendation made in the report for 1908 the Copper Center Station has been temporarily closed and the equipment transferred to the Fairbanks Station. The station was closed for several reasons. The Copper River Valley did not settle and develop as rapidly as was expected when the station was opened there some seven years ago, and on the other hand the Tanana Valley has developed very rapidly, owing to the discovery of gold and the building of the town of Fairbanks. It became imperative that a station should be established in the Tanana Valley and the Fairbanks Station was accordingly located. The appropriation annually granted for this work is not sufficient to maintain two stations doing practically the same work, under conditions which make this work very expensive, and it was therefore decided to concentrate effort at the Fairbanks Station. The Copper Center Station was particularly expensive to operate, owing to the fact that it was located more than 100 miles from the coast and could not be reached except over a mountain trail. The transportation of the necessary supplies over this trail was an item of great expense. Moreover, six crops had been raised at the Copper Center Station, and from these it was possible to draw a very fair conclusion as to the possibilities of agriculture in the Copper River Valley. The results proved that the rainfall was too light in average years to produce a normal crop of grain, and they further proved that killing frosts visited that valley usually about the middle of August, before much of the grain had matured. In view of these unfavorable conditions it was thought best to suspend operations there for a time and devote all the energy to the Fairbanks Station. The buildings at Copper Center were inexpensive, and while they together with the cleared land have been temporarily turned over to the Bureau of Education of the Department of the Interior, experiments can be resumed there whenever the Secretary of Agriculture may deem it wise to take up work again in that

locality. Mr. Neal made a trip from the Fairbanks Station overland to Copper Center in March, 1909, and transferred all of that portion of the equipment of the Copper Center Station which was worth transferring to Fairbanks. Such implements as were not needed or which could not be profitably moved were turned over to the Bureau of Education.

WORK AT THE KODIAK STATION.

The work of developing the Kodiak Station has progressed favorably during the year, but the station is not yet equipped with all that it needs in order to handle the herd of cattle properly, nor was it expected that all could have been accomplished during the time which has elapsed since work began. The work is divided between two places. At the town of Kodiak the station has a total area of about 300 acres under fence, but much of this is steep mountain sides, a considerable portion of it a dense spruce forest, and another 40 or 50 acres marsh land and small lakes, so that in all there is not much more than 100 acres of actual good pasture land, which, of course, is insufficient to support a herd of any size. It therefore became necessary to select a tract which should afford not only sufficient pasture in summer, but also meadow land for the making of hay and the cutting of grass for silage. Such a tract was found at Calsinsky Bay, 15 miles by water across an arm of the ocean from Kodiak, and here the main work of providing for the herd has been done. A large open cattle barn was built, a silo of 100 tons capacity was erected, and a small cottage for the men in charge of the cattle at that point was built. Most of this was done a year ago. During the present year fencing material for $2\frac{1}{2}$ miles of fence has been purchased and is now on hand and some of the fence has been built. A dairy building has been erected at Kodiak. Some necessary roads have been built and some land for the culture of feed and root crops has been cleared and broken. The hay barn and cattle shed have been covered with a prepared roofing. The native boards which were used for roofing were found to warp and crack so that the roof leaked badly. A combined blacksmith shop and implement shed has been built, and a water system has been installed by piping water from a mountain stream about 300 feet to the stock barn and to the cottage.

A 12-horsepower gasoline engine has been purchased, as has also the hull of a boat in which it is intended to place the engine, but at the time this report was written the two had not been put together. A launch with sufficient power to tow a lighter was absolutely necessary in order to go across the arm of the ocean above mentioned from Kodiak to Calsinsky Bay. It was thought best to get a good engine in any event, and a standard engine has been selected, but

the money available for the purpose did not make it possible to either buy or build a suitable hull. The hull of a boat which has been in use for some years was therefore bought; this will answer the purpose temporarily.

Unfortunately some cattle were lost from the herd at Calsinsky Bay last March. They died of impaction of the third stomach as a result of eating grass found along the beach after the snow went off. Snow had been on the ground for three months when this accident occurred. The cattle ran out all the time and went down to the beach every day during this period. On March 15 it was found that some of them were ailing. Only a herdsman was with them at the time and he could not determine the cause of their ailment. He gave them salts and oil and sent a native to Kodiak for the superintendent. A storm sprang up which made it impossible to return until April 1. In the meantime the medicine at the camp gave out and several cows had died before Mr. Snodgrass arrived with a new supply. He treated them with purgatives and the injection of warm soapy water and by this means saved four which were ailing, but it is well known that when impaction becomes firmly established there is practically no remedy, and so also in this case treatment proved unavailing except in a few cases with slight attacks.

The cattle were fed on hay and silage, a feed of each every day. They were not tied up, but were free to go and come to the feed shed as they pleased. Nothing in the feed given them could cause impaction, and it was only after it was all over that the cause was discovered. The snow on the beach had melted from the fallen and half-rotten beach grass; the cattle had browsed on this and thus caused the trouble. It was noticeable that it was the greediest feeders which suffered the most. Altogether 13 cows and 2 young bulls were lost. In the future a fence will prevent them from getting to the same or similar material. The cattle which survived, as well as those which escaped it altogether, went through the winter in excellent condition. It was the first winter at Calsinsky Bay, the cattle having been brought there late in the fall, and it was impossible to provide sufficient feed during the summer. The feed would have been sufficient had the snowfall been less, but the unusual happened. Kodiak winters are generally open, with spells of thawing weather occasionally, and the ground bare much of the time, but in the winter of 1908-9 the snow lay on the ground from December 14 until May 1, and the herd had to be fed during that entire period. It became necessary to buy feed, which had not been anticipated, and the expense of keeping the herd was therefore much increased.

Precautions have now been taken against a recurrence of these untoward conditions. The necessary fencing has been provided and 100 tons of silage and 75 tons of hay have been put up at Calsinsky

Bay, which should be ample to carry the herd of about 50 head located there. Instead of having but one man, two men are now with the herd during the winter, so that an emergency can be met promptly, if any should arise.

The summer conditions have been favorable to the herd. There has been no sickness among the cattle, the young stock has grown well, and all were sleek, lusty, and fat at the close of the season of pasture. The Galloways have proved themselves to be first-class rustlers. They can stand the climate well, they pay no attention to storms, their heavy coat of long hair protects them against cold, and there is no doubt whatever but that the Galloway is the breed for Alaska.

PLAN FOR THE WORK.

As outlined in last year's report, it is the plan to keep two herds at Kodiak—one of them, and the larger of the two, a breeding herd of beef cattle, at Calsinsky Bay, and the other, a small dairy herd selected from and recruited from time to time from among the best milkers in the larger herd. These dairy cows will be kept at Kodiak, where it is planned to operate a creamery on a small scale and manufacture butter and cheese from the milk. One of the objects of the work of the station is to develop an all-purpose cow from the Galloway. Alaska settlers need all-purpose cattle. The distinctive dairy breeds are not hardy enough for the climate, and a distinctive and exclusive beef breed, as the Galloway is considered to be at present, can not meet the wants of the settlers and future farmers of the Territory. The milking Shorthorn would answer the purpose if this breed were hardy enough, but the Shorthorn is too large, does not have the rustling qualities, and, being short-haired, is not sufficiently protected against the cold. The Galloway alone can meet these conditions. It is believed that by selecting the heifers which prove to be good milkers and breeding them for the milking quality and occasionally augmenting the number of milkers with purchases from outside, it will be possible in a few years to develop the milking quality, which has been systematically repressed in the breed for many years past, until a dairy strain will be secured without having sacrificed all of the qualities which go to make good beef cattle as well. Another purpose of the experiment is to breed cattle and sell the surplus produce to settlers in Alaska at a price which shall not exceed the cost of bringing cattle to Alaska from the States, and thus aid in stocking the country with a breed suited to the climate. Owing to the necessarily great expense connected with the establishment of the Fairbanks Station and the clearing of land at that place, it has not been possible to provide at once all the equipment needed at Kodiak Station. A dwelling for the superintendent is needed, but this building will have to be deferred until the herd is fully provided for.

THE COAST REGION ADAPTED TO LIVE STOCK.

That live stock can be successfully reared in the coast region of Alaska has been stated repeatedly in these reports. The climate on the whole is mild. Grass is abundant westward of the forest area, and the open season is usually long. As noted, the past season was remarkable for the fact that even at Kodiak the snow covered the ground until May 1, but even when this was the case the feeding season of 5 months was shorter than the feeding season in some of the Northern States. The temperature was mild; at no time did the thermometer fall to zero. The lowest temperatures during the months from December to April, inclusive, were as follows: December, 13°; January, 8°; February, 12°; March, 2°; and April 15° F. This, it will be noted, is mild weather for winter.

The native grasses are nutritious. It is not necessary to feed cattle grain in order to keep them growing and in good healthy condition. At the experiment station native pasture will be depended on for summer feed, and for winter feed chiefly hay and silage made from the native grasses. The winter feed can, however, be supplemented by oat hay and by root crops, turnips, ruta-bagas, and other forage crops which it may be found desirable to raise. A patch of spurry grown at Kodiak the past season grew well and produced pasture which was much relished by the cattle.

RECOMMENDATIONS.

It is recommended that an experiment be made with the introduction and breeding of the yak in Alaska. The yak (*Bos grunniens*) is a native of the high Himalayas, Tibet, and the country north of the Himalayan mountain range. It is inured to cold weather, it is accustomed to hard conditions of life, and is a good rustler for a living. Moreover, when tamed it is a gentle, tractable ox used for labor and as a burden bearer. In its native country it has a long coat of hair, even longer than that of the Galloway, and there is little doubt but that this ox could adapt itself to the conditions of interior Alaska. It seems that it would be well worth while to incur the comparatively small cost of importing a bull and two females at least and placing them at one of the Alaska experiment stations. It seems likely that a cross on the Galloway would produce an animal which would combine the desirable qualities of both animals, intensify the hardiness of the Galloway, and increase the length of its coat so as to make the hide rival or perhaps excel that of the practically extinct American buffalo. The yak has large horns; possibly a cross on the Galloway might develop a breed without horns. The matter has been investigated, and it is found that the yak has been introduced into England and is bred successfully there. They can be bought there and delivered in New York at reasonable prices.

It is also recommended that a dozen or more head of Iceland sheep be imported into Alaska. Iceland has a breed of sheep which, it is said, has been reared there for upward of 200 years. It is a large mutton sheep with a coarse wool, and it possesses a hardiness and rustling quality peculiar to no other sheep. This sheep can also be obtained in England at a reasonable price. It is respectfully recommended that an appropriation of \$3,000 be asked of Congress for the introduction of these new and promising species of live stock.

FARMERS AT WORK.

There are a number of progressive and successful farmers in the neighborhood of Fairbanks, and their operations will undoubtedly be of interest. These men found a good market for agricultural produce and set to work to supply it. The brief data which are here submitted are only samples of the work that is being done.

One of the very successful farmers is Mr. William Young. He cultivates 50 acres, which are devoted to diversified crops. Fifteen acres of this land was the past season devoted to barley hay, of which he raised 25 tons. The grain was almost mature when the hay crop was harvested and would have matured completely if left standing. Several acres had been seeded to winter wheat in the fall of 1908, but it was seeded too late to come up before frost and the crop did not fully mature, though a small percentage of the grain was ripe enough to grow. Several acres were seeded to buckwheat (Pl. VI, fig. 1). It had nearly all matured when a destructive frost killed the crop on August 25. Six acres of winter wheat were seeded early the present fall (1909) and had a fine start before the ground froze. Hay is an important crop and always sells at a good price, from \$60 to \$100 a ton, according to the requirements of the market. This season Mr. Young raised 18 tons of potatoes on 3 acres of ground, and half of this crop was produced on 1 acre which had been heavily fertilized. The potatoes were of the finest quality; the variety Early White Ohio is his favorite. Five tons of cabbage were raised on 1 acre; heads weighing 15 pounds each were not uncommon, but the average run of the heads would weigh from 4 to 8 pounds each. Mr. Young thinks that the variety known as Washington Wakefield is a better yielder and therefore more profitable than the Jersey Wakefield. Seven and a half tons of carrots were raised on 1½ acres; he prefers the early growing short varieties. He also has a large greenhouse in which he raised early vegetables for which there is a ready market—lettuce, radishes, cucumbers, and tomatoes. He also keeps 250 Brown Leghorn hens. Though feed is expensive, they nevertheless yield a profit. Fresh eggs are worth \$2 a dozen in the winter season. But the most interesting feature of his farm is the raising of pigs. He has 9 Berkshire



FIG. 1.—BUCKWHEAT, AUGUST 10, 1909, YOUNG'S FARM, NEAR FAIRBANKS.



FIG. 2.—CELERY GROWN BY MR. RICKERT IN FAIRBANKS.





FIG. 1.—FIRST CROP OF OATS, MR. BALLAINE'S FARM, NEAR FAIRBANKS.



FIG. 2.—POTATO FIELD, MR. BALLAINE'S FARM, NEAR FAIRBANKS.



brood sows and a Poland China male. These sows each have a litter, and early this fall he had a total of 52 pigs, ranging from 6 weeks old to pigs weighing 150 pounds. He keeps them in a warm house, partitioned off into small pens on either side of the central aisle. The pens are cleaned every day and the place kept sweet and tidy. They are fed largely on the waste from the garden and farm, and when opportunity offers he also buys damaged grain from merchants and shippers which he uses for hog feed. The hogs yield him a good profit. Fat hogs bring 30 cents a pound and young pigs 75 cents a pound.

Mr. E. G. Murray furnishes another example of what can be done in farming, although his farm is small. He has located on a homestead $1\frac{1}{2}$ miles from Fairbanks, and has at present only 7 acres under cultivation, but the past season he raised 10 tons of good oat hay on 6 acres. One acre was devoted to garden truck. From 125 pounds of seed he harvested 3,000 pounds of fine potatoes. The rest of his garden stuff consisted of cabbage, carrots, peas, and turnips, all of which were of the finest. He also put up 20 tons of native blue-top hay at his homestead, for which he found a ready market.

Mr. Arthur Hyde is another successful farmer, who is located on a homestead 6 or 7 miles from Fairbanks. He devoted most of his land to oat hay and the past season harvested 10 tons on 10 acres of land which had been cropped in hay regularly for several years. He also raised 3 tons of fine potatoes and $1\frac{1}{2}$ tons of fine cabbage, many of the heads weighing from 8 to 12 pounds each and some even larger. His rhubarb, celery, turnips, and other garden stuff were exceptionally fine. Oats seeded on new ground which had been thoroughly burned over made 2 tons of hay per acre.

Mr. Hampton Ballaine is another successful farmer. He has located on a homestead which adjoins the experiment station. This is his first season's crop. He had 11 acres under cultivation, from which he raised 8 tons of oat hay, 3 tons of potatoes, 2 tons of turnips, and 1 ton of cabbage (Pl. VII, figs. 1 and 2).

Mr. J. P. Rickert is a very successful market gardener and he also farms on an extensive scale. His homestead is located on the edge of the town of Fairbanks and he has about 100 acres under cultivation. He keeps a herd of dairy cows, a large flock of White Leghorn chickens, and not a few head of hogs, and he sells milk and butter, eggs, and pork in the Fairbanks markets, but he devotes himself chiefly to market gardening. He raises large areas of cabbage, cauliflower, turnips, carrots, and every kind of vegetable which can be successfully grown here. In 1908 he had a bed of strawberries, the plants having been brought in at considerable expense during the winter, planted in boxes in the greenhouse and later planted in the open, where they produced a crop. But all these plants were winter-

killed, and last summer no strawberries were found on the place. Mr. Rickert has several large greenhouses, which are devoted mainly to the raising of tomatoes and cucumbers. Fairbanks people spend money freely and ready sale is found for fresh ripe tomatoes at from 50 cents to \$1 a pound, according to the supply. Cucumbers sold for \$2 a dozen and even as high as \$5 a dozen for the earliest produced. Celery is one of the profitable crops. Mr. Rickert raises the plants in the greenhouses and then plants them out on prepared beds heavily fertilized with well-decayed stable manure (Pl. VI, fig. 2). The plants are set so close that the stems are shaded with the leaves and therefore require no artificial blanching. Early in August this celery was ready for market. The town consumes a large amount of celery, and fine plants bring as much as 50 cents each.

Mr. John Charley, a French Canadian, who has had several years' experience in subarctic horticulture, is one of the most successful gardeners at Fairbanks. He cultivates several acres located on the edge of town. In the winter of 1907-8 he brought into the country at great expense 10,000 strawberry plants. He had grown strawberries successfully at Dawson and felt that he could do equally well at Fairbanks with this choice product. In the summer of 1908, the first season after the plants were set out, he raised over a thousand quarts. These berries sold from \$1.25 a quart to \$2 a quart, the latter price being for the earliest and best berries, the former for the late and small berries, and by the quart is meant the ordinary little strawberry box. He expected to reap a plentiful harvest from his strawberries the past season, but his hopes vanished when the spring revealed that the strawberry plants had all winterkilled. He then planted the whole of his acreage to vegetables and had the past season one of the finest vegetable gardens ever seen. Potatoes and cabbage were the main crops, but there was also celery, carrots, parsnips, onions, cauliflower, and every other kind of vegetable that could be successfully grown. His place is located close to the slaughterhouse where manure and slaughterhouse offal can be had in abundance. He applied these fertilizers without stint and the result was a truly astonishing crop. It was said that the sales from about 2 acres were expected to reach \$7,000.

FERTILIZERS ESSENTIAL.

All the successful farmers and market gardeners are agreed upon one thing, and that is that the ground must be well fertilized. While Alaska soils are probably as rich in plant foods as soils elsewhere, this plant food does not appear to be present in a readily available form. Experience proves that to raise large crops the land must be abundantly fertilized. This is true even of new land which has not been exhausted by cropping, and since there is comparatively little

live stock in Alaska, fertilizers are at a premium. Chemical manures are shipped in by some farmers who find it profitable to do so. Alaska soils are not rich in the sense that they contain an abundance of available plant food. When the ground is frozen for seven months of the year there is but little chance for vegetation to decay and the elements to disintegrate into their constituent parts so as to be available for a succeeding crop. Stable manure is a valuable product and should be saved with care and applied with judgment. The beginner will make money if he will heed this precept.

MR. HIELSCHER'S EXPERIENCE.

Mr. J. F. Hieltscher is one of the progressive, energetic, wide-awake homesteaders in the neighborhood of Fairbanks. Mr. Hieltscher selected a likely piece of land for his homestead about 4 miles from Fairbanks, and he has now been at work there nearly 3 years. He has excellent judgment and his opinions are of value; liberty is therefore taken to reproduce excerpts from a letter which he has sent in reply to a request for his opinion concerning farming in Alaska:

In the interior of Alaska, where the population consists chiefly of placer miners or people who depend upon the placer mines for support, it is my opinion that farming will not pay sufficiently for an ambitious man; that is to say, the man who wants to make more money by farming than he can in the States. In order to improve his farm he will reinvest his profits in buildings and improvements, and after a while when the placer camp is worked out his earnings are in the farm and the farm is worth nothing. It can not be sold and it can not be rented. It is dead capital. But for the man who is satisfied with a good living and moderate profits and who is satisfied with the conditions of the country, the interior of Alaska is the place. He can make a living here more easily than in any other country, but most men want more than a living. If possible, the farmer in this country should have a side issue of some sort, as, for example, the cutting and selling of wood in the winter, or if he has a good native meadow he can make hay for market.

To depend solely on potatoes, cabbage, carrots, etc., is not a reliable source of profit, and the farmer must bear in mind that he can not raise large and successful crops unless he uses fertilizers in abundance. Manure at the stables in town costs \$1 per load, and to this should be added a cost of \$3.50 or \$4 a load for the hauling. Then he must remember that it will take the manure about two years to decay, because the ground is too cold for it to decay and greatly benefit the crop the first year. As a proof that the soil needs fertilizer I shall state that the past season I seeded turnips on unmanured land in drills 3 feet apart to allow the use of a horse cultivator, and the plants were thinned to 6 inches in the row. The crop was well cared for, being frequently cultivated and hoed, but, as stated, no fertilizers were applied. Not one turnip was more than 4 inches in diameter, and most of them were no larger than eggs. Oats and barley sown for hay on unfertilized ground yielded about half a ton to the acre. The plants did not stool much and did not grow over 14 inches in height, but oats, spring wheat, and potatoes planted on new ground which had been thoroughly burned produced perfect crops. (Note the fact that the ground had been thoroughly burned over—C. C. G.) The hay crop was 3 tons to the acre and potatoes yielded 6 tons to the acre. I shall sow this land to the same crops next year and find out if the ashes will benefit the second year's growth.

I find that potatoes grown on the flat where the ground is moist are always soggy, while those raised on the hillside, planted about 3 inches deep, grow to a larger size and are dry and mealy. From one-half bucket of potatoes cut to one eye I raised and gathered 5½ sacks of large potatoes from the hillside on a strip of ground where piles of cordwood had been burned during a forest fire. Oat hay on this same ground was 5 feet tall and so thick that it choked the mower in cutting it, but within 10 feet of this heavy growth, where the ground had not been burned, the oats did not stand thick enough to cut. This proves to my mind that the land needs potash. I brought 300 pounds of nitrate of soda and superphosphate with me over the trail from Valdez last winter, and wherever I applied these fertilizers to potatoes and cabbage the effect could be readily seen. They were a darker green color and grew a larger leaf. This all proves that it pays to use commercial fertilizers, if one can afford to buy at a cost of about \$125 a ton. The proverb that "All things come to him who waits" applies to farming in Alaska. Those who can not wait for the proper improvement of the soil should never come here to farm. Their reports will do more harm than the good reports of ten who are willing to wait and in the meanwhile are satisfied with a good living.

NOTES ON NURSERY STOCK AND VEGETABLES AT THE SITKA STATION.

By R. W. DE ARMOND, *Assistant, Sitka Station.*

While the winter of 1908-9 was more severe than the normal winters at Sitka, trees and bushes did not suffer as much as usual from frost heaving the ground. This was due partly to the earth being banked about the trees and a good blanket of snow covering the ground during the severe weather. All of the growth of 1908 was more or less winterkilled.

The season, like last year, has been very wet and cold, causing a late start and slow growth; however, the new wood was more nearly matured this season than during any previous year. The apple trees were sprayed three times with Bordeaux mixture this season; the first time before the buds began to open. There was no fungus growth, partly due, perhaps, to the cool weather. The new growth was pinched back, as last year, but the leaves were allowed to fall naturally; they colored up and dropped earlier than usual.

APPLES.

PLAT 1.

Whitney: June 1, 17 trees, nearly full leaf, tips winterkilled. July 15, 2 inches growth, thrifty. October 1, 6 inches growth, wood rather soft, leaves green.

Yellow Transparent: June 1, 19 trees, buds just opening; three-fourths of 1908 growth killed back. July 15, 3 inches growth. October 1, 1 foot growth; leaves on most trees coloring, others green and thrifty; wood in fair condition.

Peerless: June 1, buds starting; all 1908 growth winterkilled. July 15, 4 inches growth. October 1, 18 inches growth, very thrifty, wood soft.

Martha: June 1, 7 trees, nearly full leaf; growth of 1908 winterkilled. July 15, 4 inches growth. October 1, 8 inches growth, wood more mature than other varieties; leaves falling.

Lowell: June 1, 4 trees; and Red Astrachan, 10 trees, all dead.

Tetofski: June 1, 9 trees, buds opening. July 15, growth very short, appear thrifty. October 1, 4 inches growth, leaves falling.

Eureka: June 1, 13 trees, few buds swelling, very backward. July 15, making thrifty growth. October 1, 1 foot growth, wood very soft, leaves green.

Sylvan Sweet: June 1, 16 trees; growth of 1908 all winterkilled; buds beginning to swell. July 15, 4 inches growth, thrifty. October 1, 18 inches growth, leaves coloring, wood in good condition.

Brier Sweet: June 1, 2 trees; 1908 growth all winterkilled; very backward in starting. July 15, 6 inches growth, spindling. October 1, 18 inches growth, wood very soft.

Pyrus baccata: June 1, 13 trees, nearly full leaf; 1908 growth half killed back. July 15, 4 inches growth. October 1, 2 feet growth, leaves turning.

Transcendent: June 1, 2 trees, nearly full leaf; 1908 growth two-thirds killed back. July 15, 6 inches growth. October 1, 1 foot growth, leaves falling, wood in fair condition.

Hibernal: June 1, 7 trees, making good start; 1908 growth killed back half. July 15, 4 inches growth. October 1, 1 foot growth, leaves turning, wood in fair condition.

Hyslop: June 1, 6 trees, nearly full leaf; 1908 growth all winterkilled. July 15, new growth very short, thrifty appearance. October 1, 6 inches growth, wood soft.

Raspberry: June 1, 18 trees, well started, tips winterkilled. July 15, 3 inches growth, very thrifty. October 1, 9 inches growth, wood very soft.

Red June: June 1, 15 trees, making very slow start; all of 1908 growth winterkilled. July 15, growth very short, appear thrifty. October 1, 12 inches growth, wood very soft, leaves coloring.

Iowa Beauty: June 1, 3 trees, making good start. July 15, very poor. October 1, growth very short, leaves fallen, in poor condition.

Maiden Blush: June 1, 2 trees, making fair start; 1908 growth all winterkilled. July 15, 3 inches growth. October 1, 6 inches growth, good condition.

Early Harvest: June 1, 13 trees, making slow start; 1908 growth all winterkilled. July 15, growth short, appears thrifty. October 1, 1 foot growth, wood very soft.

Northwest Greening: June 1, 2 trees, very backward; 1908 growth all winterkilled. July 15, short growth, looks well. October 1, 1 foot growth, very soft, poor condition.

Okabena: June 1, 2 trees, very backward; 1908 growth all killed. July 15, little growth. October 1, 6 inches growth, in fair condition.

Yellow Siberian: June 1, 8 trees, tips winterkilled; nearly full leaf. July 15, short growth, unthrifty. October 1, 4 inches growth, wood well matured.

Green Sweet: June 1, 1 tree, nearly full leaf; 1908 growth all winterkilled. July 15, thrifty appearance, growth short. October 1, 4 inches growth, wood in good condition.

Patten Greening: June 1, 7 trees, leaves well advanced; 1908 growth half killed back. July 15, 3 inches growth. October 1, 18 inches growth, wood very soft.

Jessie: June 1, 7 trees, nearly full leaf. July 15, 4 inches growth. October 1, 8 inches growth, wood in good condition.

Princess Louise: June 1, 1 tree, dead.

Duchess: June 1, 8 trees, leafing slowly; 1908 wood nearly all winterkilled. July 15, 4 inches growth, thrifty. October 1, 16 inches growth, wood in fair condition.

Walbridge: June 1, 1 tree, very backward. July 15, 4 inches growth. October 1, 18 inches growth, wood very soft.

North Star: June 1, 2 trees, badly winterkilled, few buds show life. July 15, 2 inches growth. October 1, 1 foot growth, wood very soft.

Orange: June 1, 8 trees, nearly full leaf. July 15, 3 inches growth. October 1, 1 foot growth, wood in fair condition.

Jeannette Winter: June 1, 4 trees, leafing slowly. July 15, 3 inches growth. October 1, 1 foot growth, wood in fair condition.

Dartt: June 1, 8 trees, leafing slowly; 1908 growth winterkilled. July 15, short growth. October 1, 6 inches growth, wood in good condition.

Greenwood crab: June 1, 6 trees, leafing slowly; 1908 wood killed. July 15, 5 inches growth. October 1, 1 foot growth, wood well matured.

Alexander: June 1, 1 tree, very backward. July 15, 3 inches growth. October 1, 6 inches growth, wood in fair condition.

Wealthy: June 1, 2 trees, very backward. July 15, very little growth. October 1, 5 inches growth, wood very soft.

Native crab (*Pyrus rivularis*): June 1, 24 trees, full leaf; one tree full of bloom buds. June 28, bloom hand fertilized. July 15, 6 inches growth. October 1, 8 inches growth, wood mature. October 25, fruit picked.

PLAT 2.

Hibernal: June 1, 7 trees, nearly full leaf; 1908 growth half killed back. July 15, 3 inches growth. October 1, 6 inches growth, wood in good condition.

Whitney: June 1, 5 trees, leafing slowly, tips winterkilled. July 15, 2 inches growth. October 1, 4 inches growth, wood in fair condition.

Red June: June 1, 4 trees, nearly full leaf; tips winterkilled. July 15, 3 inches growth. October 1, 16 inches growth, wood very soft.

Yellow Transparent: June 1, 4 trees, leafing slowly. July 15, 3 inches growth. October 1, 9 inches growth, wood soft.

Transcendent: June 1, 2 trees, nearly full leaf; 1908 growth all dead. July 15, 5 inches growth. October 1, 16 inches growth, wood in good condition.

Northwest Greening: June 1, 2 trees, nearly dead. July 15, 4 inches growth. October 1, 1 tree dead, other made 1 foot growth, wood very soft.

APPLES ON NATIVE CRAB STOCK.

Lowell: June 1, 5 trees, 1 making good start, others very backward; 1908 growth all killed. July 15, 7 inches growth. October 1, 16 inches growth, wood well matured.

Red June: June 1, 1 tree, very backward. July 15, short growth. October 1, 2 inches growth, looks well.

Okabena: June 1, dead.

Duchess: June 1, 2 trees, dead.

APPLES NORTH OF CREEK.

Wealthy: June 1, 106 trees, leafing slowly. July 15, 4 inches growth. October 1, 18 inches growth, wood in good condition.

Tetofski: June 1, 54 trees, rather backward. July 15, 3 inches growth. October 1, 18 inches growth, new wood very soft.

Charlamoff: June 1, 4 trees, leafing slowly. July 15, 4 inches growth. October 1, 15 inches growth, new wood soft.

Virginia: June 1, 8 trees, nearly full leaf. July 15, 6 inches growth. October 1, 2 feet growth, wood in fair condition.

Grant: June 1, 200 trees, nearly full leaf. July 15, 6 inches growth. October 1, 18 inches growth, new wood very soft.

Whitney: June 1, 57 trees, rather backward. July 15, 3 inches growth. October 1, 1 foot growth, new wood very soft.

Iowa Beauty: June 1, 97 trees, rather backward. July 15, 4 inches growth. October 1, 15 inches growth, new growth soft.

Jenkins: June 1, 11 trees, very backward. July 15, 3 inches growth, unthrifty appearance. October 1, 8 inches growth, wood in fair condition.

Seedlings (set 1907): June 1, 112 trees, very backward. July 15, few making thrifty growth. October 1, 15 inches, average growth, good condition.

Mixed Seedlings (set 1909): 581. July 16, all making good growth. October 1, 1 foot growth, good condition.

Greenwood crab (set 1909): 32. July 16, all doing well. October 1, 1 foot growth, wood very soft.

Gould crab seedlings: 81, set spring 1909. July 16, all making good growth. October 1, 15 inches growth, in fair condition.

Yellow Siberian crab: 241, set spring 1909. July 16, few died, balance making good growth. October 1, 15 inches growth, leaves green, wood soft.

APPLE TREES IN BREWERY LOT.

Strawberry: July 15, 390 trees, full leaf, thrifty; tips winterkilled. July 15, 5 inches growth. October 1, 18 inches growth, wood soft.

Fanny: June 15, 5 trees, 3 dead, very backward. July 15, 4 inches growth. October 1, 12 inches growth, fair condition.

Golden Sweet: June 15, 5 trees, badly winterkilled, leafing slowly. July 15, 4 inches growth. October 1, 1 foot growth, new wood very soft.

Sweet Bough: June 15, 5 trees, nearly all dead. October 1, 1 tree alive, 2 inches growth, very poor condition.

Benoni: June 15, 3 trees, rather backward. July 15, growth very short. October 1, half inch growth.

Whitney, Primate, Williams Favorite, Early Strawberry, and Summer Rose: June 15, all dead.

Pyrus baccata: June 15, full leaf, tips winterkilled. July 15, 6 inches growth, thrifty. October 1, thrifty, 2 feet growth, wood soft.

Orange: June 15, 95 trees, thrifty start, tips winterkilled. July 15, 8 inches growth. October 1, 2 feet growth, very thrifty, wood soft.

DWARF APPLE TREES.

Sweet Bough, Primate, Fanny, and Red Astrachan: June 15, all dead.

Tetofski: June 15, full leaf, tips winterkilled. July 15, no growth. October 1, 1½ inches growth, appear thrifty.

Golden Sweet: June 15, badly winterkilled; leafing slowly. July 15, 3 inches growth. October 1, 15 inches growth, new wood very soft.

Early Harvest: June 15, badly winterkilled; leafing slowly. July 15, very little growth. October 1, 8 inches growth, new wood very soft.

Keswick Codlin: June 15, nearly full leaf, tips winterkilled. July 15, 4 inches growth. October 1, 18 inches growth, new wood very soft.

Yellow Transparent: June 15, badly winterkilled; nearly full leaf. July 15, appears thrifty, growth short. October 1, 1 foot growth, wood very soft.

APPLE GRAFTS, 1909.

The grafts were put out in May. Of most varieties 80 per cent grew. These were taken up and heeled in during October, as follows:

Hibernal 258, Yellow Transparent 411, Yellow Transparent on native crab 41, Whitney 317, Whitney on native crab 4, Duchess 442, and Iowa Beauty 84. The following scions were sent to the station by B. W. Heikel, State Pomologist of Finland: Mustiala White Summer 2, Hamberg-Amateur Early Summer 4, and Goretscheff Early Summer 2.

Juneberry: June 1, nearly full leaf; many flower buds; tips badly killed by frost. June 15, in bloom. July 15, yet blooming, fruit setting well. October 1, 1 foot growth; leaves falling, fruit yet clinging to the bushes; fruit is worthless.

CHERRIES.

The cherry trees were slightly injured by the severe freezing of last winter. They did not bloom as freely as usual and there were but few cherries formed. No fruit ripened.

English Morello: June 1, leaves developing slowly. June 15, in bloom. July 15, 5 inches growth; very little fruit set. August 15, no fruit ripened, 10 inches new growth. October 1, 20 inches growth.

Ostheim: June 1, leaves slowly developing; tips slightly winterkilled. June 15, in bloom. July 15, 3 inches growth; very little fruit set. August 15, no fruit ripened. October 1, 6 inches growth.

Early Richmond: June 1, buds opening; 1908 growth nearly all killed. July 15, growth very short, in bloom. August 15, no fruit, 4 inches growth. October 1, 1 foot growth.

Dyehouse: June 1, buds opening; 1908 growth half killed back. July 15, growth very short, blooming. August 15, few cherries formed. September 15, cherries ripened, balance cracked open. October 1, 15 inches growth.

Sand Cherry (Western): June 1, winterkilled badly, very backward. July 15, making some growth. October 1, made short growth, in fair condition.

Seedling cherries (set spring, 1908): June 1, in poor condition. July 15, making some growth. October 1, 18 inches growth, wood soft.

PLUMS.

Sayles, Hawkeye, Rollingstone, and Scout: June 1, all dead.

Wyant: June 1, badly winterkilled; gives some promise. July 15, making good growth. October 1, 3 feet growth, new wood very soft.

Desoto: June 1, 2 dead, balance budding. July 15, 6 inches growth, very spindling. October 1, 2 feet growth, wood very soft.

Odegard: June 1, 5 trees, badly winterkilled. July 15, 1 foot growth. October 1, 2 feet growth.

Prunus besseyi: June 1, 30 trees, nearly full leaf, tips badly winterkilled. July 15, 6 inches growth. October 1, 1 foot growth, leaves falling.

Americana Mixed: June 1, winterkilled to the ground. July 15, 1 foot growth. October 1, 3 feet growth, wood very soft.

Seedling of Wyant: June 1, badly winterkilled; leafing slowly. July 15, 1 foot growth. October 1, 3 feet growth, wood very soft, leaves green.

Seedling of Cherry Plum: June 1, badly winterkilled; leafing slowly. July 15, 1 foot growth. October 1, 3 feet growth, new wood very soft.

CURRENTS.

All varieties of currants started growth early, the native varieties exceptionally early. The crop of fruit was not as heavy as last year, nor did the clusters ripen evenly. There was practically no fungus growth, which has been so prevalent, especially on the black varieties.

Red, native currant of Kenai: June 1, 5 bushes, 3 inches growth, blooming. July 15, very thrifty, 15 inches growth, little fruit set. August 15, no fruit ripened, thrifty growth. September 15, 2 feet growth, leaves falling. October 1, wood well matured.

Black, native of Kenai: June 1, 48 bushes, 3 inches growth, in bloom. July 15, thrifty, 15 inches growth, very little fruit. August 15, fruit dropped, 18 inches growth, leaves falling. October 1, wood in fair condition.

Red, native of Tyonok: June 1, growing nicely; one bush blooming. July 15, 18 inches growth, very thrifty, has a strong tendency to trail. August 15, no fruit, making vigorous growth. October 1, 3 feet growth, wood in good condition.

Red, native of Sunrise: June 1, growing nicely, plants small. July 15, making thrifty growth. August 15, appear thrifty, growth short. September 15, making slow growth. October 1, growth short, good condition.

Black, native of Sunrise: June 1, plants growing nicely and blooming. July 15, thrifty, 15 inches growth, no fruit set. September 15, 18 inches growth, leaves dropping. October 1, new wood in splendid condition.

Red Cross: June 1, 2 inches growth, full bloom. July 15, 6 inches growth, fruit well set. August 15, 1 foot growth, fruit ripening. August 23, fruit picked. September 15, 2 feet growth, leaves dropping, good condition.

Wilder: June 1, 3 inches growth, full bloom. July 15, 8 inches growth, fruit poorly set. August 15, fruit ripening, picked August 25. October 1, 2 feet growth, leaves falling.

Ruby Castle: June 1, 2 inches growth, full bloom. July 15, 1 foot growth, fruit poorly set. August 15, fruit ripe, very poor, picked August 19. October 1, 18 inches new growth, good condition.

Victoria: June 1, 2 inches growth, full bloom. July 15, 1 foot growth, fruit well set. August 15, fruit ripening, picked August 23. October 1, 3 feet growth, leaves falling.

Fay: June 1, 2 inches growth, full bloom. July 15, 8 inches growth, fruit well set. August 15, fruit ripening. August 26, fruit picked, good quality. October 1, 2 feet growth, leaves fallen, good condition.

White Currant: June 1, 2 inches growth, full bloom. July 15, 8 inches growth, fruit set about half crop. August 15, fruit nearly ripe, picked August 23, good quality. October 1, 3 feet new canes, leaves falling.

Russian Black: June 1, full leaf, bloom buds opening. July 15, thrifty, 1 foot growth, new canes 2 feet long, fruit poorly set. August 24, fruit picked, berries large and of good quality. October 1, 3 feet new canes, leaves falling.

Champion: June 1, full leaf, bloom buds opening. July 15, 4 inches growth with 18 inches new canes; very little fruit set. August 24, fruit picked, good quality. September 15, new canes 3 feet long, leaves coloring.

Lee: June 1, full leaf, bloom buds opening. July 15, new canes thrifty, old wood rather unthrifty, leaves small and yellow, fruit dropped. October 1, new canes 3 feet long, leaves dropped, in fair condition.

Common Black: June 1, full leaf, bloom buds well formed, backward in opening. July 15, 1 foot growth, no fruit. October 1, new canes 3 feet long, leaves falling, wood very soft.

Native Black (Sitka): June 1, 3 inches growth, full bloom. July 15, 1 foot growth, fruit poorly set. August 15, fruit dropped. October 1, 2 feet growth, leaves gone.

Manitoba: June 1, 2 inches growth, bloom buds nearly open. July 15, bloom killed by mildew, 6 inches growth. August 15, 1 foot growth. October 1, 2 feet growth, leaves gone.

CURRENT CUTTINGS.

The following 1908 rooted cuttings, put out June 20, made good growth: Russian Black 103; Champion 174; Common Black 462; White 76.

In 1909 cuttings of the following were well rooted and made good growth: Russian Black 241; Champion 359; Ruby Castle 535; Fay 153; Red Cross 138; Common Black 562; Lee 176; Wilder 380; Victoria 587; Common Red 502.

Alpine Currant: Forty-nine set out May 27. July 15, few growing. October 1, 6 alive, 1 foot growth.

CURRENT SEEDLINGS.

The seedlings of the native currants were seeded in spring of 1908, came through the winter in poor condition, and made very little progress this season. All in poor condition.

GOOSEBERRIES.

All gooseberries in plat No. 1 were divided and reset this spring. Most of these made a good growth: Columbus 7, made some growth; English 33, 6 inches growth; Industry 11, very little growth; Champion 120, 6 inches thrifty growth; Smith Imperial 19, 4 inches growth; Whitesmith 24, 4 inches growth; Red Jacket 27, 6 inches growth.

SEEDLING GOOSEBERRY, 1908.

Whitesmith 148, 6 inches growth; Industry 10, 4 inches growth; Champion 1, 3 inches growth; English 15, 5 inches growth; Smith Imperial 19, 8 inches growth.

CUTTINGS, 1909.

The following cuttings made but little growth and developed but a poor root system: Triumph 2; Red Jacket 5; Industry 1; English 10; Champion 235; Smith Imperial 32.

GOOSEBERRIES, PLAT 2.

English: June 1, 2 plants, full leaf, thrifty, 1 in bloom. July 15, 4 inches growth, very few berries. October 1, 8 inches growth, good condition.

Champion: June 1, 28 bushes, full leaf and bloom. July 15, 8 inches growth, bushes well loaded with fruit. August 25, fruit picked. October 1, 1 foot growth, good condition.

Native black, of Skagway: June 1, full leaf and bloom. July 15, 6 inches growth, some fruit set. August 15, fruit ripe, picked August 20, good quality. October 1, 8 inches growth, leaves falling.

Black gooseberry, native of Kenai: June 1, very thrifty, full leaf and bloom. July 15, little growth, no fruit set. October 1, 8 inches growth, leaves falling. Appear same in all respects as those brought from Skagway.

RASPBERRIES.

Cuthbert: June 1, nearly full leaf, bloom buds well developed, more than usual injury by frost. July 15, not so thrifty as usual, past full bloom, fruit setting well. August 15, berries rather below normal size, bushes not heavily laden. August 30, beginning to ripen. September 12, began picking. October 1, 6 feet new canes, some berries yet to pick.

Miller: June 1, nearly full leaf, bloom buds small. July 15, new canes 3 feet long, full bloom. August 15, fruit poor. October 1, canes slender, 4 feet long, fair condition.

Turner: June 1, nearly full leaf, little injury by frost, bloom buds very small. July 15, new canes 3 feet long, full bloom. August 30, fruit ripe, better quality than in previous seasons. October 1, 5 feet canes.

Loudon: June 1, nearly full leaf, very little injury by frost. July 15, full bloom, new canes short. August 30, fruit ripening, somewhat larger than usual. October 1, canes 3 feet long, fair condition.

Fuller: June 1, 1 foot of all canes killed back; nearly full leaf. July 15, full bloom. August 30, fruit ripening, too small to pick. October 1, 4 feet new canes, fair condition.

Cuthbert Raspberry \times Salmon Berry: June 1, many plants killed back by the frost; full leaf; 1 plant in bloom May 27. July 15, all making thrifty growth; vary greatly; bloom set no fruit. October 1, new canes from 18 inches to 3 feet high, leaves dropping.

Cuthbert Raspberry 1909 seedlings \times Salmon Berry: Set in the open June 21, made a short growth; covered November 1 for winter protection.

STRAWBERRIES.

Notes on the fruiting hybrids were kept separate. The 1908 seedling hybrid plants were transplanted from the flats to the open ground as they became large enough. Following are the hybrids: Enhance \times Native; Hollis \times Native; Magoon \times Native; and Bismarck \times Native.

The 1909 hybrid seedlings were planted in the open during July. Enhance \times Native, Hollis \times Native, Magoon \times Native, and Bismarck \times Native all made good growth and are in good condition to withstand the winter.

A few berries were obtained from using pollen of native plants from the interior, Magoon \times Interior Native, also more seeds from crossing Magoon \times Native. These with the Magoon \times Interior Native have been stratified and will be seeded next spring.

The interior strawberry makes a poor spindling growth here. A few new plants were produced this season and a very small bloom, the pollen of which was taken for crossing purposes.

ORNAMENTALS.

Rosa rugosa: The old plants were all taken up, divided, and root cuttings made and replanted June 5. These nearly all made good growth. The 1908 seedlings were transplanted to the open at the same time. These made a thrifty growth and go into winter in good condition. The 1909 seedlings were put in the nursery row in July and are protected for winter.

Japanese and California columbines made about the same progress, so near so that a description of one fits the other. May 25, set in nursery rows. June 15, making good start. October 1, good growth, fair condition for winter.

Japanese lilac: June 15, full leaf, growing nicely. October 1, 6 inches to 1 foot growth, wood mature, leaves dropped.

Common lilac: June 15, full leaf, thrifty. October 1, 15 inches growth, wood well matured, leaves falling.

Lonicera tartarica splendens: June 1, full leaf, nearly in bloom. June 15, past full bloom, 1 foot growth. October 1, leaves dropped, good condition.

Lonicera tartarica rosea: June 1, full leaf. June 15, 3 inches growth. October 1, growth spindling, unthrifty.

Lonicera alba rosea: Same as *L. tartaria* in growth.

Caragana arborescens: June 1, full leaf. July 15, thrifty growth. October 1, 6 inches growth, good condition.

Viburnum tomentosum: 6 planted May 27. July 15, doing nicely. October 1, growth short, 5 alive.

Cotoneaster: 12 set May 28. July 15, doing well. October 1, 11 alive, growth short.

Ural willow: June 1, nearly full leaf, tips winterkilled. July 15, making vigorous growth. October 1, 3 feet growth, leaves green.

POTATOES.

POTATOES IN BREWERY LOT.

This soil received a dressing of seaweed during the winter, as last year. This was plowed under in April, and the potatoes planted May 7 and 8. The length of each row was 200 feet. The yields were as follows:

Comparative yields of potatoes.

Variety.	Marketable.	Unmarketable.	Variety.	Marketable.	Unmarketable.
	Pounds.	Pounds.		Pounds.	Pounds.
Norway No. 1, 5 rows.....	328	175	White Mammoth, 2 rows.....	183	85
Norway No. 2, 4 rows.....	482	395	Carman No. 3, 2 rows.....	275	120
Norway No. 3, 2 rows.....	152	70	Extra Early Triumph, 4 rows.....	580	180
Early John, 1 row.....	111	41	Early Harvest, 1 row.....	97	35
Irish Cobbler, 1 row.....	81	30	Total.....	4,044	1,726
Gold Coin, 3 rows.....	760	140			
Extra Early Ohio, 2 rows.....	390	165			
Early Michigan, 4 rows.....	605	290			

POTATOES IN PLAT 1.

This plat was the location of a strawberry bed for a number of years. It was plowed in April and planted to potatoes May 24. A light coat of fish guano and bone meal was sown in the drills as the planting was done. The length of each row was 100 feet. The yields were as follows:

Comparative yields of potatoes.

Variety.	Marketable.	Culls.	Variety.	Marketable.	Culls.
	<i>Pounds.</i>	<i>Pounds.</i>		<i>Pounds.</i>	<i>Pounds.</i>
Gold Coin, 10 rows.....	578	267	Extra Early, 9 rows.....	319	145
Extra Early Ohio, 7 rows.....	319	170	Solanum commersonii, 2 rows.....	41	13
Lincoln, 1 row.....	42	12			
Irish Cobbler, 4 rows.....	99	61	Total.....	1,398	668

POTATOES IN PLAT 2.

The ground was plowed in April and replowed again in May. A part of it had received a light coat of stable manure; fish guano and bone meal were put in the drill with the seed. The potatoes were planted in 180-foot rows and yielded as follows:

Comparative yields of potatoes.

Variety.	Marketable.	Culls.	Variety.	Marketable.	Culls.
	<i>Pounds.</i>	<i>Pounds.</i>		<i>Pounds.</i>	<i>Pounds.</i>
Gold Coin, 1 row.....	272	75	Vornehm, 2 rows.....	123	110
Irish Cobbler, $\frac{1}{4}$ row.....	52	10	Banner, 1 row.....	103	90
Norway No. 1, 2 $\frac{1}{2}$ rows.....	90	26	Carman No. 3, 2 rows.....	93	77
Norway No. 2, $\frac{3}{4}$ rows.....	159	110	Hamilton Early, 2 $\frac{1}{2}$ rows.....	127	122
Norway No. 3, $\frac{1}{4}$ row.....	5	10	Bovee, $\frac{3}{4}$ row.....	90	90
Ohio, jr., 2 rows.....	136	32	Eureka, 1 $\frac{1}{2}$ rows.....	13	7
White Beauty, 1 $\frac{1}{2}$ rows.....	83	41	Red River White Ohio, $\frac{3}{4}$ row.....	26	26
Extra Early Triumph, $\frac{3}{4}$ row.....	45	55	Vigorosa, $\frac{3}{4}$ row.....	20	33
Lincoln, 1 $\frac{1}{2}$ rows.....	91	110	Early Harvest, $\frac{1}{2}$ row.....	4	15
Early Ohio, 1 $\frac{1}{2}$ rows.....	53	96	Early Michigan.....	50	29
Russian, 1 $\frac{1}{2}$ rows.....	70	185	Pat's Choice.....	7	5
Extra Early, 2 rows.....	106	158	White Mammoth.....	7	13
Extra Early Ohio, 1 row.....	76	125	Burpee Early.....	11	15
Garfield, 1 row.....	98	113			
Freeman, 1 row.....	75	230	Total.....	2,085	1,999

CABBAGE

Three varieties of cabbage, Early Jersey Wakefield, Brill None-such Early, and Long Island Early, were planted. There were a few small heads, root maggots practically destroying the crop.

CAULIFLOWER.

Early Paris and Erfurt Early were planted; neither developed a marketable head, due to the root maggot.

KOHL-RABI.

Kohl-rabi were planted, but made too slow a growth to be of any value as a table vegetable. They were not greatly injured by root maggots, due to the woody nature of the outer tissues.

KALE.

The Scotch kale was planted and has made a fair crop only, owing to the same enemies that destroyed cabbage and cauliflower.

Dwarf Green Curled: Seeded May 28. June 4, through the ground. June 20, planted in open ground. July 15, very slow growth. October 15, poor quality.

Dwarf Green Scotch, S. P. I., 1897: Same as above.

Kale, S. P. I. No. 20915: Seeded in open ground June 3. June 15, germinated well; plants growing slowly. July 15, good stand, thrifty appearance. October 15, made good growth; fair quality.

Kale, S. P. I. No. 20914: Seeded in open ground June 3. June 15, seeds germinated well; second leaves developing. July 15, good stand, fair growth. October 15, small, poor quality.

TURNIPS.

Brassica rapa, S. P. I. No. 22756: Seeded in open ground June 3; plants made feeble start and were all dead October 1.

Brassica rapa, S. P. I. No. 22757: Seeded in open ground June 3. June 15, good stand, second leaves developing. July 15, thrifty growth. October 1, good crop of leaves.

Yellow Petrowski, S. P. I. No. 19554: Seeded June 3; through the ground in six days. June 15, growing very slowly. August 15, 50 per cent wormy. October 15, crop gathered, roots small, good quality. Second planting failed to develop marketable roots; 180-foot row yielded 93 pounds.

Grey Stone (Erhard Frederiksen's seed): Seeded June 3. Through the ground June 9. June 15, growing rapidly. July 15, medium leaf growth, no root development. August 15, all wormy. October 15, woody and unfit for use.

Yellow Tankard (E. F.): Seeded same date as other varieties; made more rapid growth than any other variety at first. Destroyed by worms; 55-foot row yielded 40 pounds.

Purple Top Strap Leaf: Seeded with other varieties. Made feeble start. August 15, all wormy. October 15, very small, unfit for use; 75-foot row yielded 39 pounds.

Ruta-baga, Bangholm (E. F.): Planted with turnips. June 15, first leaves well started. July 15, very slow growth. October 15, roots small, woody, unfit for use; 187 feet yielded 14 pounds.

Ruta-baga (Department seed): Developed the same as Bangholm.

Turnip, S. P. I. No. 20918: Seeded June 3. June 15, third set of leaves forming. July 15, uneven stand, tops large, very little root development. October 15, very small.

Turnip, S. P. I. No. 20483: June 3, seeded. June 15, second leaves forming. July 15, large tops, small roots. October 15, very small.

CARROTS.

Long Orange: Seeded June 4. June 15, second leaves forming. July 15, plants strong, though small. October 15, medium roots, good quality.

Chantenay, James Intermediate (E. F.), Champion (E. F.), and Stensballe (E. F.) were seeded at the same time as Long Orange; all made about the same growth, except the roots were small; good quality.

PARSNIPS.

Hollow Crown was seeded in June. No plants came.

BEETS.

Detroit Dark Red, Bastians Early Turnip, and Eclipse were planted. The seed germinated poorly. Growth was very slow and the roots small and woody.

MANGELS.

Yellow Barres No. 1 (E. F.), Yellow Barres No. 2 (E. F.), and Red Eckendorfer (E. F.) were planted. Like the beets, the seed came poorly and the roots developed but little.

PEAS.

Alaska: Planted May 20. May 31, through the ground. June 15, 6 inches high. July 15, 2 feet high, blooming. August 15, nearly ready for table use. October 15, not ripe, picked.

Gradus: Planted with the Alaska, came into bloom at the same time. About 10 days slower in development. September 1, ready for table use. October 15, not hard. Picked.

Pea, No. 6428: Seed planted May 20; none germinated.

ONIONS.

S. P. I. No. 20913: Seed planted June 5. June 15, coming up. July 15, few making some growth. October 1, very small:

Sets were also put out in June; these made very little growth, few developed top sets.

BEANS.

S. P. I. No. 20400: Seeded June 4; none germinated.

S. P. I. No. 20421: Seeded June 4. June 15, none up. July 15, good stand; plants yellow. October 15, killed by frost.

S. P. I. No. 20397: Same development as No. 20421.

S. P. I. No. 23543, Finnish runner: Planted June 4. June 15, just coming through. July 15, fair stand, plants unthrifty. October 15, frost killed.

CUCUMBERS.

S. P. I. Nos. 20919, 20920, and 20921 were planted early in June. No seed germinated.

RADISHES.

Long Scarlet Short Top, Long White Vienna, Long Brightest Scarlet, French Breakfast, and Early Scarlet Turnip were planted. Only the early breakfast varieties made good roots. The later varieties developed no root and sent up bloom stalks early. No seed ripened.

LETTUCE.

Deacon: Planted in flats in May, set in open ground in June, gave marketable heads in August. Transplanted to cold frame in June, gave marketable heads in July. Seed stalks sent up but none bloomed.

White Seeded Simpson and Yellow Seeded Butter: Planted at same time as Deacon, made slower growth, and developed no seed stalks.

S. P. I. No. 20922: Planted and treated same as other varieties. Made very slow growth. No seed stalks developed.

BARLEY.

Erhard Frederiksen's: Seeded June 4. June 15, 2 inches high. July 15, good stand, 1 foot high. October 15, not ripe, frosted.

Naked Barley, S. P. I. No. 20909: Planted June 4. June 15, 4 inches high. July 15, good stand, 15 inches high. October 15, soft milk stage, frosted.

Donnes Barley, S. P. I. No. 20608, G. I. 592, from coast of Norway: Seeded June 4, germinated very poorly. July 15, poor stand, 14 inches high. October 15, killed by frost.

OATS.

Erhard Frederiksen's: Seeded June 4. June 15, 2 inches high. July 15, good stand, 15 inches high. October 15, frosted, immature.

MISCELLANEOUS.

Medicago falcata, S. P. I. No. 24452: Seeded June 4. June 15, coming up. July 15, all dead.

Sand lucerne, S. P. I. No. 21269: Seeded June 4; no germination.

Grimm alfalfa, S. P. I. No. 21827: Seeded June 4. June 15, coming up. July 15, poor stand, 4 inches high. October 1, 1 foot high, appears thrifty.

Montana alfalfa, S. P. I. No. 25454: Seeded June 4, June 15, coming up. July 15, good stand, 5 inches tall. October 1, 18 inches high, very good.

Quinoa, Common, S. P. I. No. 18236; Quinoa, Royal, S. P. I. No. 18237; and *Phaseolus vulgaris*, S. P. I. No. 20416: Planted June 4; no germination.

Vicia cracca, S. P. I. No. 24462 (Siberian): Seeded June 4. June 15, 2 inches high. July 15, very little growth. October 1, 18 inches high, thrifty.

REPORT OF WORK AT THE RAMPART STATION.

By G. W. GASSER, *Superintendent*.

CLIMATIC CONDITIONS.

The year ended October 1, 1909, was an average one as regards both temperature and precipitation, with the exception of May and June, which were rather colder than usual. The snowfall was 39.9 inches, most of which fell before January 1. Although severely cold weather was reported from upriver, the minimum at this station was only -58° F., December 28. During January the wind blew almost continuously, amounting at times to a gale, but the cold was not excessive, -56° being the minimum for the month.

The Yukon River closed October 29 and opened May 17. Although the river was not unusually high at any time either during or after the "break-up," it remained much above normal throughout the summer. One very pleasant feature of the summer was the absence of the usual hordes of mosquitoes.

Light frosts occurred August 24 and 25 when the temperature fell to 27° both nights. Tender plants, such as potatoes and buckwheat, were either partially or entirely killed, while hardier plants escaped uninjured. No more frosts occurred until September 16. The first snow fell September 25, but only a little, and by the end of the month there was but 1.5 inches. October 1 the heaviest snowfall in 24 hours recorded at this station occurred, when 8.5 inches fell.

The total precipitation (including snow) for the year ended October 1, 1909, was 10.5 inches. Below is given the monthly precipitation and the temperature averages for 5 months:

Monthly precipitation and temperature averages, May to September, 1909.

	May.	June.	July.	August.	Septem- ber.	Total.
Precipitation (inches).....	1.04	0.85	2.01	1.41	0.36	5.67
Mean temperature ($^{\circ}$ F.).....	43.59	57.71	63.05	58.1	38.8	.....

The total precipitation for the 5 months includes 4.1 inches of snow during a part of May and September. During June the gardens particularly suffer for lack of rain, and this year was no exception; but as compared with the driest June, with 0.15 inch of rain, the June of this year appears very favorable.

WORK OF THE SEASON.

As in previous years, the work at this station is chiefly with grains, with a view to improving the present varieties by selection and acclimatization and the production of new and better strains by hand pollination. This work occupies all of the superintendent's time, and during the seeding and harvesting periods help is required.

Beginning May 15, 2 men were employed nearly all the time until July 1. From July 1, 3 men were employed steadily until the end of September, and a fourth man during the first 8 days of July. Except when needed to help care for the crops the labor employed was directed toward clearing and doing the necessary teamwork. Six acres were cleared this season, making the total under cultivation for next year 22 acres, all of which has been winter fallowed with the exception of 1 acre of the new land. Freezing weather prevented the completion.

This year a sidehill plow was adapted to use as a colter in tearing up moss and roots on new land. This was done by removing the moldboard and bolting to the standard and beam in a nearly upright position a flat piece of iron one-half inch thick by 4 inches wide by 18 inches long. The lower end of this iron was drawn out somewhat and turned forward shoe fashion and the point laid with steel. By going over the ground twice—the second time crosswise to the first—the moss was pretty thoroughly torn loose. The ground was then well harrowed with an old-fashioned figure "A" harrow, and the moss thrown in piles with pitchforks and burned. By this method a saving of 25 per cent in the cost of clearing was effected. It has been found advantageous to delay burning the stumps and other wood until the ground has been coltered, since without some wood it is difficult to burn the moss.

This spring before the field work was pressing the outside of the house was painted white, with slate-colored trimmings, a much-needed improvement. During the winter the various grains were thrashed out and cleaned and otherwise prepared for spring planting. Several pieces of necessary furniture were also made and other improvements and repair work done.

September 16 a shipment consisting of office and field supplies, including a ton of commercial fertilizer and 50 pounds of awnless brome grass, was received. This station also received 50 packages of congressional garden seeds for distribution. During the past year the call for garden seeds exceeded the supply. In addition to individuals, seeds were sent to fourteen telegraph stations in the interior and to four government Indian schools. Small amounts of station-grown seeds were also distributed to various parties. The number of letters received during the last year shows an increasing interest along agricultural lines.

GRAIN CROPS.

By May 18, $1\frac{1}{4}$ acres of new land on a knoll had dried off sufficiently to permit seeding and was sowed to common oats with a 2-horse drill. From that date on as the ground dried it was harrowed and seeded. The last grain was sown June 1, also on new land, for hay. The oats on this new land made a heavy growth and when cut for hay the middle of August much of it was 5 feet high. Curing was accomplished almost entirely in the windrow and cock and was necessarily slow. (Pl. VIII, figs. 1 and 2.) The use of a hay tedder would greatly facilitate the curing, especially during unfavorable weather. It is estimated that 9 acres produced 20 tons of hay. The station team fed on this hay keeps in good flesh at light work without any grain ration.



FIG. 1.—CUTTING OATS FOR HAY, RAMPART STATION.



FIG. 2.—MAKING OAT HAY, RAMPART STATION. YIELD, $2\frac{1}{4}$ TONS PER ACRE.



During July several crosses of barley were made, using beardless varieties for the mother plant, in the endeavor to produce hardy early varieties. More work of this nature will be done next year as well as the improvement by selection of the varieties now grown. This year much more comprehensive notes were taken than heretofore, using a conveniently arranged field note book supplemented by cards giving the botanical characteristics. These cards permit of filing away for future reference in a very convenient manner.

The first ripe grain was cut August 17, and by September 1 practically all the barley was cut. A few varieties of oats also ripened in August, but most of them were not harvested until September. In cutting several of the larger plats of oats a grain cradle was used for the first time at this station.

A two-row yield test of twenty varieties of promising barleys previously grown at this station was begun this year. This test should be continued for at least two years more in order to secure satisfactory data.

WINTER GRAIN.

WHEAT.

Kharkof, S. P. I. No. 12001: Seeded August 14, 1908; up August 19; autumn vigor poor; spring condition, 25 per cent stand, vigor fair; heading July 6; ripe August 31; grains per head 36; height 28 inches.

RYE.

G. I. No. 959, Department seed: Seeded August 14; up August 19; autumn vigor poor; spring condition, 75 per cent stand, vigor poor; heading June 23; ripe September 3; grains per head 36; height 36 inches.

G. I. No. 1134, Department seed: Seeded August 14; up August 19; autumn vigor poor; spring condition, 75 per cent stand, vigor poor; heading June 23; ripe September 3; grains per head 24; height 36 inches.

Amber Winter, station seed: Seeded August 14; up August 19; autumn vigor poor; spring condition, 60 per cent stand, vigor poor; heading June 23; ripe September 3; grains per head 36; height 46 inches.

Excelsior, station seed: Seeded August 14; up August 19; autumn vigor poor; spring condition, stand 50 per cent, vigor poor; heading June 23; ripe September 3; grains per head 36; height 48 inches.

Giant French, station seed: Seeded August 14; up August 19; autumn vigor poor; spring condition, 50 per cent stand, vigor poor; headed June 23; ripe September 3; grains per head 40; height 50 inches.

G. I. No. 281: Seeded August 14; up August 19; autumn vigor poor; spring condition, 50 per cent stand, vigor poor; heading June 30; ripe September 3; grains per head 42; height 46 inches.

G. I. No. 281: Seeded May 23, 1908; up June 6; autumn vigor excellent; spring condition, 10 per cent stand, vigor poor; heading June 23; ripe September 3; grains per head 42; height 48 inches.

EMMER.

Black Winter emmer, S. P. I. No. 19235: Seeded May 22, 1908; up June 2; autumn vigor excellent; spring condition, completely winterkilled. Same result from seed sown August 14.

BARLEY AND OATS.

G. I. No. 521, 522, 366, and Snoma oats were seeded August 14; up August 20, and went into winter in fair condition, but winterkilled completely.

SPRING GRAIN.

BARLEY.

Chittyna, Copper Center Station: Seeded May 21; up June 4; heading July 11; ripe August 31; grains per head 68; height 45 inches. A vigorous beardless variety but rather late in ripening. Several crosses have been made on this number, using pollen from much earlier bearded varieties.

Hull-less, S. P. I. No. 12709, station seed: Seeded May 19; up June 1; heading July 10; ripe August 31; grains per head 54; height 41 inches.

Yakutsk, G. I. No. 574, station seed: Seeded May 19; up June 1; heading July 8; ripe August 15; grains per head 50; height 32 inches; 95 per cent lodged.

G. I. No. 587, station seed: Seeded May 19; up June 1; heading July 6; ripe August 15; grains per head 50; height 32 inches; 95 per cent lodged.

Swedish, S. P. I. No. 19557, station seed: Seeded May 19; up June 1; heading July 6; ripe August 15; grains per head 52; 95 per cent lodged. This Swedish variety has a marked tendency to produce awnless heads, and an effort is being made to develop a pure strain with this characteristic.

Finland, G. I. No. 581, station seed: Seeded May 19; up June 1; heading July 7; ripe August 17; grains per head 50; height 35 inches; 90 per cent lodged.

Finland, G. I. No. 582, station seed: Seeded May 19; up June 1; heading July 8; ripe August 17; grains per head 44; height 35 inches; 90 per cent lodged.

Manshury, station seed: Seeded May 19; up June 1; heading July 9; ripe August 17; grains per head 66. A tall growing, stiff strawed barley, with a good record at this station.

Eagle, station seed: Seeded May 19; up June 1; heading July 10; ripe August 17; grains per head 50; height 43 inches. A 6-rowed, bearded variety, with stiff straw. According to a report made by the Bureau of Plant Industry, U. S. Department of Agriculture, this barley ranks among the best.

Abyssinian, G. I. No. 360, station seed: Seeded May 19; up June 1; heading July 11; ripe August 20; grains per head 50; height 41 inches. The finest appearing barley grown at this station, with plump well-colored heads and straw.

Abyssinian, G. I. No. 361, station seed: Seeded May 19; up June 1; heading July 13; ripe August 15; grains per head 50; height 36 inches.

Lapland, station seed: Seeded May 23; up June 6; heading July 10; ripe August 23; grains per head 58; height 50 inches.

Abyssinian, G. I. No. 362, station seed: Seeded May 19; up June 3; heading July 11; ripe August 17; grains per head 20; height 37 inches. A black two rowed Abyssinian variety, stiff strawed, and early, but otherwise not desirable.

Hannchen, S. P. I. No. 10585, station seed: Seeded May 19; up June 1; heading July 13; ripe September 1; grains per head 24; height 36 inches; 50 per cent lodged. A 2-rowed, undesirable barley.

Liland, G. I. No. 565, station seed: Seeded May 19; up June 1; heading July 13; ripe August 17; grains per head 50; height 36 inches; 98 per cent lodged.

Trysil, G. I. No. 566, station seed: Seeded May 19; up June 1; heading July 8; ripe August 17; grains per head 50; height 38 inches; lodged 100 per cent.

Oderbrucker, S. P. I. No. 10754, station seed: Seeded May 19; up June 1; heading July 10; ripe August 19; grains per head 50; height 43 inches; lodged 50 per cent.

G. I. No. 184, station seed: Seeded May 19; up June 1; heading July 8; ripe August 15; grains per head 46; height 47 inches; lodged 25 per cent.

Bodoe, G. I. No. 568, station seed: Seeded May 19; up June 1; heading July 9; ripe August 17; grains per head 36; height 36 inches; lodged 95 per cent.

Stroemmen, G. I. No. 562, station seed: Seeded May 19; up June 1; heading July 7; ripe August 15; grains per head 50; height 40 inches; lodged 50 per cent.

Moljord, G. I. No. 564, station seed: Seeded May 19; up June 1; heading July 7; ripe August 17; grains per head 56; height 37 inches; lodged 5 per cent.

Svalof, G. I. No. 560, station seed: Seeded May 19; up June 1; heading July 8; ripe August 17; grains per head 56; height 37 inches; lodged 5 per cent.

Pamir, S. P. I. No. 18922, station seed: Seeded May 19; up June 1; heading July 7; ripe August 14; grains per head 30; height 24 inches; lodged 10 per cent. A short growing variety with small heads.

Russian, G. I. No. 573, station seed: Seeded May 19; up June 1; heading July 7; ripe August 17; grains per head 42; height 32 inches; lodged 25 per cent.

Teldnaes, G. I. No. 561, station seed: Seeded May 19; up June 1; heading July 6; ripe August 17; grains per head 42; height 27 inches.

Scottish Pearl, G. I. No. 277, station seed: Seeded May 19; up June 1; heading July 6; ripe August 17; grains per head 40; height 34 inches; lodged 5 per cent.

G. I. No. 563, station seed: Seeded May 19; up June 1; headed July 6; ripe August 17; grains per head 36; height 36 inches.

Mensury, Brandon, Manitoba: Same as Manshury.

Barley from North Dakota Agricultural College: Seeded May 20; up June 1; heading July 11; ripe August 23; grains per head 36; height 42 inches. A strong, growing, 2-rowed barley identical with the 2-rowed variety from Eagle.

Boehme Beardless Hull-less Barley, S. P. I. No. 19851, Department seed: Seeded May 20; up June 1; heading July 9; ripe August 25; grains per head 48; height 40 inches; lodged 95 per cent. A beardless variety that did well in this plat, but in another plat on poor land made a very poor showing.

OATS.

Banner, station seed: Seeded May 20; up June 4; heading July 14; ripe September 5; grains per head 76; height 40 inches.

Yakutsk, G. I. No. 498, station seed: Seeded May 20; up June 4; heading July 9; ripe August 17; grains per head 80; height 38 inches.

Hvitling, S. P. I. No. 20458, station seed: Seeded May 20; up June 4; heading July 15; ripe August 30; grains per head 54; height 40 inches.

Ligowo, S. P. I. No. 20459, station seed: Seeded May 20; up June 4; heading July 14; ripe August 30; grains per head 50; height 40 inches.

Golden, S. P. I. No. 20460, station seed: Seeded May 20; up June 4; heading July 13; ripe August 30; grains per head 68; height 39 inches.

Burt Extra Early, station seed: Seeded May 20; up June 5; heading July 9; ripe August 30; grains per head 20; height 36 inches. A short-growing oat with very short head.

Probsteier, S. P. I. No. 20461, station seed: Seeded May 20; up June 4; heading July 15; ripe August 30; grains per head 65; height 45 inches.

White Probsteier, S. P. I. No. 20462, station seed: Seeded May 20; up June 5; heading July 14; ripe August 30; grains per head 54; height 46 inches.

Black Bell, S. P. I. No. 20463, station seed: Seeded May 20; up June 5; heading July 15; ripe August 31; grains per head 66; height 54 inches.

Black Great Mogul, S. P. I. No. 20464, station seed: Seeded May 20; up June 5; heading July 16; ripe August 31; grains per head 80; height 54 inches.

American Banner (Brandon, Manitoba): Seeded May 20; up June 4; heading July 15; ripe August 30; grains per head 60; height 44 inches.

Swedish Select, station seed: Seeded May 20; up June 5; heading July 14; ripe August 30; grains per head 57; height 46 inches.

No. 90, station seed: Seeded May 20; up June 5; heading July 11; ripe August 24; grains per head 62; height 44 inches. A strong growing black oat that has made a good showing the past two years.

Norwegian, G. I. No. 500, station seed: Seeded May 20; up June 5; heading July 10; ripe August 24; grains per head 70; height 45 inches. This oat is the earliest black variety grown at this station. It has been raised here two years.

North Finnish Black, station seed: Seeded May 20; up June 5; heading July 11; ripe August 25; grains per head 108; height 54 inches. A tall growing black oat rather late maturing, but nevertheless the best all round oat grown at this station.

Plats of Golden oats, S. P. I. No. 20460, North Finnish Black, and American Banner were seeded May 21 with a 2-horse grain drill at the rate of 5 pecks per acre. A good stand was secured, and the whole of the first two plats ripened fully and about 50 per cent of the American Banner, the remainder of this plat being on lower ground. All were cut September 16 with a grain cradle. The Finnish Black and Golden plats were ripe the first of the month, but cutting was delayed waiting for the shipment containing the cradle.

WHEAT.

Ghirka, G. I. No. 1517, station seed: Seeded May 19; up June 8; heading July 12. Not a full stand and did not ripen.

Romanow, station seed: Seeded May 19; up June 7; heading July 14. Did not mature.

Wild Goose (Brandon, Manitoba): Seeded May 20; up June 5; heading July 15. Did not mature.

Red Fife (Brandon, Manitoba): Seeded May 28; up June 1; heading July 11; ripe September 16; grains per head 40; height 41 inches.

BUCKWHEAT.

Russian, station seed: Seeded May 20; up June 6; blooming July 6; killed by frost August 24; a few ripe grains only; height 42 inches.

Buckwheat from Brandon, Manitoba: Seeded May 20; up June 5; blooming July 10; killed by frost August 24; height 58 inches. A very fine plat of much ranker growth than above variety. Only a few ripe grains when killed.

EMMER.

G. I. No. 375, station seed: Seeded May 19; up June 4; heading August 4; ripe September 15; grains per head 30; height 42 inches.

RYE.

Spring rye from Brandon, Manitoba: Seeded May 20; up June 1; heading July 6; ripe September 15; grains per head 40; height 60 inches. None of the varieties of rye had well-filled heads, and they ripened very slowly.

GRASSES.

The following grass and clover seeds received from the U. S. Department of Agriculture were sown in small plats June 2: Velvet grass, reed canary, alsike clover, red clover, and timothy (station seed), also the following numbers (S. P. I.) of alfalfa: 24452, 21269, 21827, 23454, and 24430. All came up well and made a good growth. The red clover and alsike clover were slightly injured by the frosts of August 24 and 25.

The white clover sown in the yard about the house last year, 1908, winterkilled completely, but the Kentucky blue grass was not injured in the least. The blue grass has made a good growth this summer. The plat of alsike clover also froze out completely. A small isolated field of about one-half acre in extent was seeded to timothy and meadow fescue in the spring of 1908. A good stand was secured and wintered in fine condition, but the growth this summer was too short to warrant cutting for hay and was used for a pasture in September after the wild grass was gone.

POTATOES.

It is becoming more and more apparent that the successful culture of the potato is attended with more difficulty than any other crop now raised in interior Alaska. At best the season is too short, and if the season is unusually cold, wet, or dry the crop is sure to suffer either in quality or quantity, perhaps both.

The area planted this year was considerably larger than in previous years. The ground was thoroughly harrowed, then laid off with a turning plow. It was thought that by planting the seed down in a furrow there would be less likelihood of the dry June weather preventing the seed from sprouting. In the bottom of the furrows a small amount of stable manure was scattered and covered with a couple of inches of earth. Every fourth row was left unmanured for a check row. The good effect of the manure was easily discernible. The cold, dry weather throughout June was so unfavorable that by July 1 the majority of the potatoes were barely more than up. The growth was very uneven in all varieties. Some vines did not begin blooming until August, others three weeks earlier. All vines were pretty badly frosted August 24-25, but during the mild weather which followed and continued till September 16 the tubers developed considerably. No doubt better results could be obtained if potatoes followed potatoes for at least two years instead of grain. Constant rotation is practiced in order to have land free from volunteer grain for experimental plats of grain the ensuing year.

The varieties and quantities of potatoes and the percentage increase are given below. Planting was begun May 19 and finished May 20. The crop was dug September 16 and 17.

Comparative yields of different varieties of potatoes.

Variety.	Planted.	Harvested.	Increase.	Variety.	Planted.	Harvested.	Increase.
	Pounds.	Pounds.	Per ct.		Pounds.	Pounds.	Per ct.
Gold Coin.....	26.5	144	444	Freeman.....	2.0	11	450
Snow Flake, Jr.....	4.5	6	33	Garfield.....	1.0	8	700
Irish Cobbler.....	10.5	55	402	Vornehm.....	2.5	7	180
Early Ohio.....	36.0	200	450	Russian.....	1.0	Failure.	.....
White Beauty.....	1.0	Failure.	.....	Vigorosa.....	2.0	9	350
Extra Early Triumph.....	6.5	31	376	Oregon.....	1.5	5	233
Ohio Junior.....	4.0	18	350	Norway No. 1.....	2.5	7	180
Extra Early Ohio.....	3.0	13	333	Norway No. 2.....	2.0	6	200
Red River Ohio.....	1.0	6	500	Norway No. 3.....	1.5	Failure.	.....
Carman No. 3.....	7.0	30	328	Burpee Early.....	1.0	6	500
Early Market.....	4.5	21	366	White Mammoth.....	.5	2	300
Extra Early Pioneer.....	7.0	39	459	Pat's Choice.....	.25	2	700
Extra Early.....	3.0	13	333	Banner.....	1.0	3	200
Bovee.....	2.5	10	300	Early Harvest.....	.25	3	1,100
Hamilton Early.....	4.0	25	525	Eureka.....	20.0	88	340
Early Michigan.....	3.0	12	300	Burbank.....	64.0	297	364
Lincoln.....	3.0	12	300				

GARDEN CROPS.

The ground intended for garden was fall manured and plowed, and in the spring it was given another light coat of stable manure and then gone over with a 5-tooth cultivator to thoroughly mix the manure with the soil. The location on a rather steep hillside is an ideal one except that the ground is apt to become too dry during June. This proved to be the case this year, so that the seed sown on the steepest portion did not germinate at all. Nevertheless the garden was a great success. All vegetables gathered September 16 and 17.

Peas, Alaska: Planted May 24; up June 6; made a vigorous growth; ready for table use July 7; injured by frost August 24-25. Extra Early gave similar results, vines of both varieties growing over 5 feet high. Nott Excelsior is a dwarf pea and did not do very well. This variety podded freely but not continuously.

Beets, Crimson Globe: Planted May 24; up June 8; averaged small, largest 10 inches in circumference.

Beets, Dewing: Planted May 24; up June 9; largest 12 inches in circumference.

Carrots, Oxheart: Planted May 24; up June 9; ready for table use July 30. A short root averaging well. Largest 8.5 inches in circumference.

Carrots: Danvers, Chantenay, and Long Orange are practically the same in appearance, being long and tapering. Planted May 24; up June 10; largest 6 inches in circumference.

Spinach, Long Standing: Planted May 24; up June 10. Made a fine growth, furnishing an abundance of greens tender and wholesome.

Salsify, Mammoth Sandwich: Seeded May 24; up June 12. Very imperfect stand. Made fair growth, but roots small when pulled.

Lettuce, Early Curled Silesia and others: Seeded May 24; up June 8. A most delicious variety for all summer use. Large enough for use June 28.

Lettuce, Early White Cabbage: A fine variety for late summer, forming large firm heads, tender and sweet, that will keep after pulling if stored in a cool dry place.

Lettuce, May King: Not as desirable as the other varieties.

Radish, French Breakfast: A cylindrical-shaped sort, very tender and crisp. Continues to be the best, either for hotbed or open garden.

Radish, Scarlet Turnip: Second in quality to French Breakfast.

Radish, Long Scarlet: Of little value in interior Alaska. All varieties seeded May 24; up June 11, and ready for table use June 28.

Mustard, Fordhook Fancy: Seeded May 25; up June 10; large enough for table July 10. Cut repeatedly during the summer.

Rhubarb, Victoria: Seeded May 25. Did not germinate.

Parsley, Moss Curled: Seeded May 25; up June 6. Did well. Very hardy. Late in the fall several plants were potted and kept in the house for winter use.

Onion, Round Yellow Danvers: Seeded May 25. Did not come up for nearly a month because of the dry weather, then only a partial stand. Made a good growth; in fact did better than the sets put out of the previous season's growth, except that the latter were a little earlier.

Top sets from Pullman, Mich. Those put in the hotbed May 15 made a good growth, but did not get very large. The sets put in the open garden made a poor growth.

Kale, Dwarf Curled Green Scotch: Seeded May 25; up June 7. Evidently this was not a dwarf variety, for it grew tall and upright, the highest attaining a height of 24 inches. When the garden was plowed this fall the plants were lifted with a spading fork and bunched up and covered with straw. In this manner it keeps well until used.

Turnips, Golden Ball, station seed: Seeded May 25; up June 7; large enough for use July 24. One of the best turnips grown here, smooth and free from root maggots. Largest 22.5 inches in circumference.

Turnips, Petrowski: Same dates as above. A yellow-fleshed turnip of good quality. Free from root maggots. Largest 14 inches in circumference.

Turnips, Red Top Strap Leaf: A white-fleshed variety of medium quality. A few wormy. Largest 22 inches in circumference.

Turnips, Gratscheff: A white-fleshed Swedish variety of good quality, but much eaten by root maggots, also split badly. Largest 25.5 inches in circumference.

Ruta-baga, Purple Top: Seeded May 25; up June 7. Many of the roots undersized. Largest 20.5 inches in circumference.

Kohl-rabi, Large White: Seeded May 25; up June 7; 95 per cent grew stems of edible size; toward fall they became woody and tough. Largest 16 inches in circumference.



FIG. 1.—FIRST BUILDINGS, FAIRBANKS STATION, BIRCH TIMBER IN BACKGROUND.



FIG. 2.—FIRST PLOWING, FAIRBANKS STATION.



FIG. 3.—FIRST CROP, POTATOES AND OATS, FAIRBANKS STATION.



Cauliflower, Snow Ball: Seeded in hotbed May 1; transplanted to open ground May 29; good stocky plants. Made a fine growth, but only 30 per cent produced heads, the largest 8 inches in diameter.

Cabbage: Early Winningstadt and Early Jersey Wakefield were seeded in hotbed and transplanted the first week in June. They were fine plants and all grew. First head used July 30. Winningstadt made the better showing and was seemingly a little earlier. A good many of the heads weighed 6 pounds. Heads of the other variety were smaller.

REPORT OF WORK AT THE FAIRBANKS STATION.

By J. W. NEAL, *Superintendent.*

Continuing the narrative of improvements and cultural work from the last report, 4 acres of heavy birch hill land has been cleared ready for cultivation next year (Pl. IX, figs. 1 and 2). The remainder of the 45 acres cleared last summer is broken ready for spring seedling. About half of the cleared land and a large pasture have been fenced. Construction work on the barn was carried far enough last fall to store the crops and stall four horses, and one room of the temporary dwelling was made habitable for winter quarters, and the proposed cellar completed. In July another room was added to the dwelling and at this date two more rooms are nearing completion with a 13 by 26 cellar beneath.

An implement shed and seed room and a blacksmith shop and tool room are much needed, and will be built during the early winter. A well was dug 40 feet deep last winter, developing enough water for house use. It may be interesting to note that no frost was encountered in digging this well except in the first 2 feet.

THE VEGETABLE GARDEN.

No direct experiments are being carried on in the way of growing vegetables. Nearly all hardy vegetables were successfully grown in the station garden this year, however.

Rhubarb seedlings from last year made fine stems this year, many of them 12 to 18 inches long and 1 inch thick.

Celery plants started in a hotbed and transplanted to the open early in June made fine stems 12 to 18 inches long; very tender and crisp.

Cauliflower plants started under glass, transplanted to larger boxes, and finally set in the open the first week in June, made very fine heads of nearly 2 pounds each. A hundred plants made as many very choice heads.

Early Jersey Wakefield cabbage set in the open June 10 made good heads of fair size. The writer saw cabbage in Fairbanks single heads of which weighed 25 pounds.

POTATOES.

The following varieties, all native seed, were planted June 4 on new ground broken late in September, 1908, and covered with a liberal dressing of new stable manure in the spring, which was plowed under just before the potatoes were planted. The vines

were slightly frosted August 25 and killed by heavy frost September 16. The results with the different varieties are given in the following table:

Comparative yields of different varieties of potatoes.

Variety.	Length of row.	Yield.	Size of tubers.
	<i>Feet.</i>	<i>Pounds.</i>	
Garfield.....	35	25	Medium to small.
Norway No. 2.....	69	49	Do.
Early Ohio.....	46	36	Medium to large.
Burbank.....	21	14	Medium.
Early Harvest.....	6	4	Medium to small.
Russian stock.....	7	4	Very small.
Lincoln.....	13	9	Medium.
White Mammoth.....	12	9	Large.
Extra Early Triumph.....	34	23	Medium to small.
Snowflake Junior.....	57	43	Medium to large.
Bovée.....	17	9	Medium to small.
Extra Early.....	17	17	Medium.
Hamilton.....	21	17	Do.
Norway No. 1.....	21	17	Do.
Vornehm.....	20	12	Medium to small.
Vigorosa.....	17	16	Medium to large.
Ohio Junior.....	13	8	Medium.
Freeman.....	13	14	Medium to large.
Early Michigan.....	12	9	Medium to small.
Commercial variety, fifth-year native.....	147	114	Medium to large.
Early Market.....	21	11	Medium.
Red River White Ohio.....	20	12	Do.
White Beauty.....	14	10	Do.
Burpee Early.....	12	7	Medium to small.
Carmen No. 3.....	22	17	Medium.
Extra Early Pioneer.....	39	38	Large.
Irish Cobbler, from Sitka 1907 crop.....	20	17	Medium to small.
Norway No. 3.....	30	17	Medium to very small.
Irish Cobbler, from Eagle 1907 crop.....	90	77	Medium to large.
Extra Early Ohio.....	9	13	Do.
Banner.....	22	22	Large.
Eureka.....	150	120	Medium to large.

The Eureka, Gold Coin, and Early Ohio were grown in large plats and all yielded well on the best ground without any fertilizer. Much of the ground yielded little more than three times the seed planted.

The entire crop of potatoes amounts to 4 tons of fair marketable size.

FIELD CROPS.

Thirty-two varieties of grain were seeded in small plats on new ground of southern exposure, the various spring varieties being also seeded on lower ground which was broken the fall of 1907 and cropped last year. The new ground mentioned above was seeded to Manshury barley last year by disking the seed in without breaking the ground. The barley having matured reseeded the ground and came up so thick that it checked the growth of the spring seeding and no attempt was made to take notes on this series.

Twenty-seven varieties of pedigree grains were transferred from the Copper Center Station and seeded in 1-year-old ground. Unfortunately this soil became so dry while being prepared for this collection, there being no rain until June 26, that much of the seed did not come up until July. Large patches in the field plats did not come up until after the rain of June 26 and had just headed when the main crop was cut for hay August 21 to 24.

WINTER GRAINS.

Winter wheat: This wheat was obtained by Professor Georgeson from a garden in Fairbanks, Alaska, in August, 1908, and seeded on August 15 at the station, the seed having yet scarcely hardened, although it was quite matured. The seed was a little slow in germinating and did not make much fall growth but wintered fine and had

made a fair start by June 15; July 1, 15 to 24 inches high and heading; July 15, 24 to 36 inches high and blooming, some heads half filled; August 19, many heads ripe enough to harvest for seed; the whole crop had ripened by September 1. This is a beardless wheat of very fine quality. The heads average 3 inches in length, having about 40 to 45 kernels to the head. This is a soft or starchy wheat.

Romanow wheat: This variety was received from Hot Springs September 1, 1908, and seeded the next day. The ground was getting cold and the seed germinated very slowly, making little fall growth. A fair stand wintered; very slow to start in the spring; July 1, 15 to 20 inches high, about heading; July 15, 30 to 40 inches high and blooming; August 19, some heads ripe enough to harvest for seed. Nearly all of this variety ripened by September 1. This is a bearded variety, heads good size, very uniform and well filled; a very hard glutinous wheat.

Winter rye, S. P. I. No. 19556: Seeded August 15, 1908; came up in 7 to 8 days and made a very fair fall growth; a good stand wintered and made 10 inches growth by June 1; June 15, 24 to 30 inches high and heading; first heads appeared June 13; July 1, 60 inches high and blooming; August 1, grain hardening; August 19, thoroughly matured.

Winter rye, S. P. I. No. 11268: Seeded August 15, 1908; came up in 7 to 8 days and made a fair fall growth; all winterkilled.

Barley, Tennessee Winter, G. I. No. 386: Seeded August 15; up in 6 to 8 days, and made a good fall growth; a very poor stand wintered; June 15, making fair growth, few heads showing; July 15, 20 to 30 inches high, grain well filled; August 1 matured fair seed.

Emmer: Seeded August 15, 1908; made a fair fall growth; about 50 per cent of the crop lived through the winter; July 1, 15 inches high and about ready to begin heading; July 15, 30 to 40 inches high, headed and blooming; August 15, grain passing to dough; continued to ripen very slowly and not quite mature enough for seed when frosted.

SPRING GRAINS.

Oats, American Banner, from Manitoba: Seeded May 22; up June 1; good stand; July 1, 4 to 8 inches high; July 15, 18 inches high and heading; August 15, 24 to 36 inches high; grain in the milk; September 1, grain well matured.

Oats, North Finnish: Seeded May 22; coming up June 1, good stand; July 1, 4 to 8 inches high; July 15, 18 to 20 inches high and heading; August 15, 30 to 36 inches high, grain in the dough and straw ripening fast; September 1, grain well matured.

A small plat seeded May 23, from native grown seed, was heading July 15; made about the same growth but matured a few days later.

A volunteer patch of the same variety had thoroughly matured by August 20.

Oats, S. P. I. No. 20464: Seeded May 22; coming up June 1, good stand; July 1, 4 to 8 inches high; July 18, 15 to 18 inches high and a few heads showing; August 15, 30 inches high, grain in the milk, some smut present; September 10, grain matured.

Oats, S. P. I. No. 20460: Seeded May 22; coming up May 30, good stand; July 1, 4 to 8 inches high and some heads showing; August 15, 30 inches high, grain in the dough and straw ripening fast; September 1, grain well matured.

Oats, S. P. I. No. 10624: Seeded May 22; coming up June 2, good stand; July 1, 3 to 7 inches high; July 15, 12 to 18 inches high, few heads showing; August 15, 30 to 36 inches high, grain in the milk and straw ripening fast; September 10, grain matured.

Oats, S. P. I. 20458: Seeded May 22; coming up May 31, good stand; July 1, 4 to 8 inches high; July 15, 12 to 18 inches high, few heads showing; August 18, 30 inches high, grain nearly in the dough and straw ripening; September 5, grain matured.

Sixty-Day oats: Seeded May 22; coming up June 1, good stand; July 1, 4 to 7 inches high; July 15, 15 to 20 inches high and about all headed; August 15, 24 to 30 inches high, grain beginning to harden; August 25, grain matured.

Oats, S. P. I., No. 20463: Seeded May 22; coming up June 1, good stand; July 1, 4 to 9 inches high; July 15, 12 to 18 inches high, few heads showing; August 15, 30 to 32 inches high, grain nearly in the dough, straw turning fast; September 1, grain matured.

A small plat seeded May 23, from native-grown seed, made a little better growth, but only a small percentage matured with the above. The most of the crop ripened, however, before any killing frost came.

Oats, S. P. I. No. 20462: Seeded May 23; coming up May 30, good stand; July 1, 5 to 9 inches high; July 15, 18 to 24 inches high, beginning to head; August 15, 30 to 36 inches high, grain nearly in the dough, considerable smut present; September 10, grain matured.

A small plat seeded May 23, from native-grown seed, began heading by July 15, and ripened about with the above or a little later.

Oats, S. P. I. No. 18245: Seeded May 22; coming up June 1, poor stand; July 1, 4 to 8 inches high; July 15, 18 to 20 inches high, beginning to head; August 15, 30 to 36 inches high, grain in the milk; September 10, about half of the crop matured.

Oats, S. P. I. No. 20459: Seeded May 22; coming up June 1, poor stand; July 1, 4 to 8 inches high; July 15, 15 to 20 inches high and beginning to head; August 15, 24 to 30 inches high, grain in the milk, straw turning, some smut present; September 10, most of the crop had matured.

Oats, S. P. I. No. 20461: Seeded May 22; coming up June 2, poor stand; July 1, 4 to 8 inches high; July 15, 18 to 24 inches high, beginning to head; August 15, 24 to 36 inches high, grain in the milk, and straw ripening. The most of the crop had matured by September 10.

Barley No. 279 (Professor Hansen's): Seeded May 22; coming up May 30, good stand; July 1, 6 to 10 inches high; July 15, 24 to 30 inches high, headed; August 1, grain well in dough, straw golden; August 15, mature enough to harvest for seed.

A small plat seeded May 23, from native-grown seed, made about the same growth, with little or no perceptible difference in the date of maturing.

Hanna barley, S. P. I. No. 5793: Seeded May 22; coming up May 30, good stand; July 1, 6 to 10 inches high; July 15, 20 to 30 inches high and nearly all headed; August 15, 24 to 36 inches high and the grain beginning to harden; September 1, grain matured.

Manshury barley, from Manitoba: Seeded May 22; coming up May 30, good stand; July 1, 6 to 10 inches high; July 15, 20 to 30 inches high and nearly all headed; August 15, 36 inches high, grain beginning to harden; September 1, grain well matured.

A small plat seeded May 23, from native-grown seed, ripened a few days earlier.

A volunteer patch stood 36 to 48 inches high and in full head July 15; August 15, about ripe enough to harvest; well matured by August 25.

Naked barley, S. P. I. No. 19851: Seeded May 22; coming up May 30, good stand; July 1, 8 inches high; July 15, 18 to 30 inches high, nearly all headed; August 15, grain beginning to harden; September 1, about half of the crop had matured and all had matured by September 10.

A small plat seeded May 23, from native-grown seed, behaved about the same as the above and all matured.

Beardless barley, S. P. I. No. 19852: Seeded May 23, from native-grown seed; came up by June 1, poor stand; July 1, 4 to 6 inches high; July 15, 18 to 24 inches high, and heading; August 20, grain passing to the dough; September 1, earliest heads matured; much of the crop did not mature.

Hull-less barley, S. P. I. No. 12709: Seeded May 22; coming up May 30, good stand; July 1, 6 to 9 inches high; July 15, 20 to 30 inches high, nearly all headed; August 15, grain well in the dough; September 1, earliest heads matured; all well matured by September 10.

Wild Goose wheat, from Manitoba: Seeded May 22; coming up June 2, good stand; July 1, 8 to 10 inches high; July 15, 20 to 30 inches high and beginning to head; August 15, 40 to 42 inches high, grain in the milk; continued to ripen very slowly; crop nearly matured when damaged for seed by heavy frost September 16.

Durum wheat: Seeded May 22; coming up June 3, good stand; July 1, 6 to 8 inches high; July 15, 18 to 21 inches high and beginning to head; August 15, 30 to 36 inches high, grain nearly in the milk; continued to ripen very slowly; crop nearly matured when damaged by frost September 16.

Red Fife wheat, from Brookings, S. Dak.: Seeded May 22; coming up June 1; good stand; July 1, 7 to 9 inches high; July 15, 20 to 24 inches high and beginning to head; August 15, 30 to 36 inches high, grain in the milk; continued to ripen very slowly; crop nearly matured when damaged by frost September 16.

Selected Red Fife wheat, from Manitoba: Seeded May 22; coming up June 3, good stand; July 1, 7 to 9 inches high; July 15, 20 to 24 inches high and heading; August 15, 30 to 36 inches high, grain in the milk; continued to ripen very slowly; crop nearly matured when damaged by frost September 16.

Romanow spring wheat, from Hot Springs: Seeded May 23; coming up June 2, good stand; July 1, 6 to 9 inches high; July 15, 15 to 18 inches high, and beginning to head, August 15, 24 to 36 inches high, grain about in the milk; September 1, ripening very slowly; a few heads were barely mature enough to harvest when killing frost came September 16.

Buckwheat: Seeded May 23; coming up June 3, good stand; July 1, 3 to 5 inches high; July 15, 8 to 15 inches high and blooming; August 1, 18 to 30 inches high, grain forming; August 15, grain in the milk; a few grains were almost mature when the whole crop was killed by frost August 25, 26, and 27.

Rye, G. 1. No. 280: Seeded May 22; coming up June 2, good stand; July 1, 8 to 12 inches high; July 15, 30 to 40 inches high and heading; August 15, 36 to 48 inches high; grain nearly in the milk; August 25, ripe enough to harvest for seed.

Spring rye: Seeded May 23; coming up May 31, good stand; July 1, 12 to 16 inches high; July 15, 40 to 48 inches high, in full head and blooming; August 15, grain in the dough; September 1, matured.

PEDIGREE GRAINS TRANSFERRED FROM COPPER CENTER STATION.

This collection of grains has been selected from crops which have matured at the Copper Center Station during the last four years. The plan adopted was to select the earliest maturing heads and seed the same separately the following year, the seed being lettered in alphabetical order, A representing the first selection of seed. It is to be regretted that these grains were seeded on ground which became so dry during the spring cultivation that the seed in most instances did not germinate until after a heavy rain which fell on June 26, as stated elsewhere in this report. This tract was selected as the warmest and most favorable ground for the experiment, little thinking but that rain would come in due time, the same ground being actually too wet to seed a week later the year previous.

WHEAT.

Early Riga C, Ladoga D, and Romanoff C, seeded May 23, all failed to germinate.

OATS.

Volunteer B, a sport: Seeded May 23; just headed August 1; a few heads nearly matured September 16, when damaged by frost.

Volunteer Black A: Seeded May 23; begun heading July 15; ripened by September 1.

Finnish Black D: Seeded May 23; few stalks; about heading July 15; few heads matured by September 1.

S. P. I. No. 15857 B: Seeded May 23; about heading July 15; few heads ripe September 1.

White Finnish Black B, sport of Finnish Black: Seeded May 23; first up was about heading July 15, and ripened by September 1.

S. P. I. No. 10624 B: Seeded May 23; none matured.

Minnesota Wild A: Seeded May 23; one head ripened.

BARLEY.

Semi-Beardless B: Seeded May 23; heading August 1; few heads nearly matured when damaged by frost September 16.

Yakutsk B, white bearded: Seeded May 23; heading August 1; nearly matured when frosted September 16.

Sport of Giant Head B: Seeded May 23; portions of this plat coming up June 2; and was heading July 15; grain nearly maturing September 10.

Hull-less Black B: Seeded May 23; matured a few heads September 15.

Hybrid Pamir and Champion A: Seeded May 23; coming up June 1; headed by July 15; grain barely matured September 15, escaping heavy frost.

Chittyna B: Seeded May 23; parts of this plat coming up June 2; about heading July 15; grain almost matured when damaged by frost September 16.

Russian, S. P. I. No. 20786 A: Seeded May 23; portions of this plat up June 1; headed July 15; grain matured September 5.

Swedish select A: Parts of this plat up June 2; 30 inches high and heading July 15; almost matured September 10, ripened fair grain.

S. P. I. No. 12709 B: Seeded May 23; some coming up June 1; about heading July 15; barely matured September 15.

Yakutsk A, stock seed: Seeded May 23; portions of this plat coming up May 31; few stalks 30 inches high and headed July 15; barely matured September 15.

Hybrid No. 3 A, Pamir Champion: Seeded May 23; none matured.

Pamir B: Seeded May 23; barely matured a few heads September 15.

Hybrid No. 1 A, Pamir Champion Lucile A: Seeded May 23; none matured.

Hybrid No. 2 A, Pamir Champion Georgeson A: Seeded May 23; barely matured a few heads September 15.

No. 12709 B, stock seed: Seeded May 23; found one head matured September 16 when killing frost came.

Russian A, stock seed: Seeded May 23; parts of this plat coming up June 1; 30 inches high and headed July 15; matured September 5.

GRASSES.

Alsike clover: Seeded August 15, 1908; made a fair start and wintered well; made only 6 to 8 inches growth, but covers the ground thickly. Spring seeding made about the same growth.

Orchard grass: Seeded August 15; made a splendid fall growth and wintered well; season's growth 12 to 16 inches covering the ground thickly. Spring seeding made about the same growth.

Timothy: Seeded August 15; covered the ground well by winter; spring growth covered the ground well by June 15; heading July 1; growth, short stems, small heads; season's growth about 20 inches. Spring seeding made excellent stand, but little shorter growth.

Meadow fescue: Seeded May 24; coming up June 5; made fair growth and an excellent stand.

Grimm alfalfa, S. P. I. No. 21827; sand lucern, S. P. I. No. 21269; *Medicago falcata*, S. P. I. No. 24452; and Montana alfalfa, S. P. I. No. 23454, were seeded May 24 in rows; coming up June 8 to 11; made 6 to 10 inches growth for the season.

Vicia cracca, S. P. I. No. 24462, imported: Seeded May 24; none came up.

The following pedigree grasses were transferred from Copper Center Station and seeded May 24:

Alopecurus pratensis, native A: Up June 8; made 6 inches growth and a good stand.

Agropyron tenerum A: Up June 6; made 8 inches growth and a fair stand.

Poa (?), native A: Made little growth and a poor stand.

Black top grass, 1908 test A: None came up.

Agropyron pseudo-repens, native 1908 A: Made 6 inches growth and a poor stand.

The season opened very favorably, but continued dry too late in the summer for most crops, retarding the early growth. The first wetting rain fell June 26; frequent light showers continued through the remainder of the growing season. The first frost appeared August 25, 26, and 27, killing the buckwheat and all the potato vines in the lower field, singeing the tips of the potato vines in the next higher tract. The next killing frost appeared September 16, killing all crops not then matured.

The frequent showers during the haying season made it very difficult to cure the hay crop. It was found necessary to stir the hay after being mowed to hasten drying, and this process proved both slow and expensive. Thus the hay got wet three times before it could be gotten into the shock, and had to be rescattered after each rain. A tedder would have been a very useful implement and saved its cost in labor, to say nothing about the probability of getting the hay in the shock without getting wet. Several dozen bundles of the grain were cradled and bound to test the possibility of cutting the hay crop with a self-binder, which proved very satisfactory, and it is recommended that a self-binder be shipped in next season with a view to curing the hay in the sheaf next year. It is estimated that this will lessen the cost of handling the crops fully one-half and insure the curing of a better grade of hay; then in storing the crop it can be handled much faster and requires much less storing space. In a country of this kind it is economy to have at hand every labor-saving device, and the best on the market is none too good or too expensive.

REPORT OF WORK AT THE KODIAK LIVE-STOCK AND BREEDING STATION.

By M. D. SNODGRASS, *Superintendent.*

Work at the Kodiak Live-Stock and Breeding Station has been carried on about as outlined in the annual report for 1908, with the exception of work on the proposed dairy building.

The work of clearing the meadow land of fallen dead timber and brush was resumed in the spring as soon as the snow was off the ground, and a road was built in the hillside around a deep lagoon in order to connect the beach meadows with the rest of the meadow land. About 75 acres of land has been cleared for mowing with a machine. Over much of the tide lands where beach grass is cut for silage driftwood is carried by the extreme tides twice each year. This has left a considerable amount of driftwood and logs that have to be removed before mowing over the ground with a machine. This work is being done as rapidly as time will permit.

The work of fencing is progressing nicely, and by the close of this season the meadow lands will all be fenced. The work of fencing all pasture lands will be resumed in the early spring. Two tons of barbed wire was purchased this year, and posts cut from spruce trees, for $2\frac{1}{2}$ miles of fencing.

The cattle barn and hay barn at Calsinsky Bay were covered with a prepared roofing this fall. The native lumber with which these buildings were covered had so shrunken that it was necessary to put on a more substantial roof.

A combination blacksmith shop and machine shed, 14 by 16 feet, was built of native lumber and covered with a prepared roofing. This affords shelter for all machinery used at Calsinsky Bay and gives ample room for a workshop. Heretofore machinery had to be stored in the cattle barn and all blacksmith work had to be done at Kodiak, some 15 miles distant.

A water system has been put in for the house use and for the stock at the barn. It consists of 300 feet of $\frac{3}{4}$ -inch piping from a small reservoir made by damming a small stream which comes down from the mountains and runs near the house. A water tank and tank heater have been ordered so as to have the chill taken out of the water during the cold weather. Heretofore the cattle have been watered at the running streams from the mountains, where the water is very cold.

HAYMAKING AND PUTTING UP SILAGE.

The growing season was short, but otherwisc favorable. Beach grass came slowly in the spring. By May 1 the beach grass afforded a little grazing where the tides had melted the snow and ice during the month of March, but the meadow lands were covered with snow until May 10. By June 1 there were but few spears of grass showing. Warmer weather in June and July gave a good growing period, and by July 25 beach grass was ready for cutting. The cutting of beach grass for silage was begun July 27 and the 100-ton silo was filled by August 24. During the next five weeks a few loads of silage were cut and the silo was kept full as it settled. By the last of September the silage was fully settled and the silo was filled up for the last time. The work of putting up silage and making hay alternated between wet and dry days after August 4, when the first dry hay was cut.

The native bluetop yielded a very good crop of hay this season, but there was little favorable weather for haymaking until after September 20. Then occurred the first frost of the season, and clear weather and strong westerly winds prevailed the remainder of the month. During the month of August about 85 tons of hay were cut and cured, but the continuous rainy weather from August 28 to September 12 made it impossible to get all of it under shelter before

it was ruined by the rain. About 30 tons of hay were lost by the rain and 15 tons badly damaged. About 20 tons of hay were cut in September, all of which was cured without having any rain upon it. About 75 tons of hay in all were secured this season. It is estimated that sufficient feed for the station herd has been secured, even though the season has been a poor one for haymaking.

Equipment for haying is inadequate to the needs of the station. Only two teams of horses are kept for general farm work, and there is need of three teams at least. Two mowers, one hay rake, and one wagon are used at present. An extra wagon is necessary for rapid work during the few dry days that come in haying time. One team has to be kept at Kodiak for a part of the time to put up hay for the dairy station, and this makes it more necessary to have additional teams.

CLIMATIC CONDITIONS.

The fall months of 1908 were very wet, but not cold. The latter part of October and the first week of November was the only period of good weather during the two months. From November 7 to 30 it rained every day except four, and in all 14.11 inches of water fell during this period. But $2\frac{1}{2}$ inches of snow fell during November. The first four days of December were rainy, followed by fair weather for ten days. December 14, 4 inches of snow fell, followed by $4\frac{1}{2}$ inches two days later. This snow did not go off, as is usually the case in this region during the winter, but was followed by 15 inches of snowfall in January, $12\frac{1}{2}$ inches in February, 37 inches in March, and 4 inches in April. The ground was covered with snow from December 14 until April 28 at Kodiak, while at Calsinsky Bay the snow lay on the ground several days later. During this period the snow on the ground varied in depth from 2 to 24 inches. The sun shone on about two-thirds of the days, and the percentage of cloudy weather was much less than is usual for that time of the year.

The spring was very late and backward. Frost was not out of the ground until late in May, and the growth of grass was very slow until the first of June. The month of May was characterized by partly cloudy weather and frequent showers. June, July, and August were good growing months. The total hours of sunshine for these months was much greater than is usual for this region. The months of August and September were characterized by uncertain weather for haymaking. From August 6 to 13 there was good haying weather, and not again until after September 19, when there were ten good days.

The rainfall for the growing months was not excessive, and was well distributed throughout the period. All vegetation made a splendid growth, and pasture and hay were never better on this island, and grew until the first frosts came, September 21, 26, 27, and 29.

Summary of weather record from October 1, 1908, to September 30, 1909.

Month.	Temperature.			Precipitation.		Character of weather.			
	Maximum.	Minimum.	Mean.	Total.	Snow-fall.	Clear.	Partly cloudy.	Cloudy.	Rain or snow.
October.....	°F. 54	°F. 18	°F. 37.90	Inches. 6.91	Inches. 1.0	Days. 7	Days. 11	Days. 13	Days. 13
November.....	.....	17	.....	14.11	2.5	1	11	18	20
December.....	.....	13	.....	7.15	11.0	5	18	8	14
January.....	.....	8	.....	1.33	15.0	5	19	7	9
February.....	a 40	12	a 28.65	1.53	12.5	2	20	6	12
March.....	42	2	28.69	3.92	37.0	1	21	9	18
April.....	50	15	35.03	5.41	4.0	2	24	4	11
May.....	63	26	41.07	4.97	.5	3	23	5	16
June.....	76	34	46.94	7.25	.....	3	19	8	16
July.....	73	38	52.86	2.92	.....	1	23	7	13
August.....	72	37	54.83	5.12	.....	8	13	10	17
September.....	58	26	46.06	4.64	.5	8	11	11	15
Total.....	.....	.....	.....	65.26	84.0	46	213	106	174

^a For the last sixteen days of February. The maximum thermometer was broken November 2, 1908, and not replaced until February 13, 1909.

From a stockman's standpoint the fall of 1908 was favorable for putting up hay and silage, and cattle, where allowed to run on the beach grass, held up in flesh well into December. November was very wet and delayed the freezing which usually kills the beach grass earlier in the season. The station herd was not put on regular feed until December 14, when the pasture was covered by snow. Up to that date the cattle had been fed only on the stormiest days, but were free to go into shelter at night or when they chose. The snow remained upon the ground from December 14 to May 1, except where the tides melted it from the flats at the head of the bays. The winter was colder and drier than usual for this region, but at no time did the thermometer register as low as zero, and cattle did not suffer from cold. The long period of deep snow made it impossible for cattle to browse as much as is usual, consequently the feeding period was longer than expected and many settlers ran short of feed. Beach grass afforded some grazing by May 1, and the hillsides exposed to the sun for the greater part of the day furnished some feed by June 1. By June 10 pasture was generally good. The sun shone considerably more this season than last and the grass afforded much better pasture for the whole period than the previous summer. The fall weather this year was not favorable for making hay, but in August and September each 8 days were clear, and 17 and 15 days, respectively, were rainy.

By comparing the weather for the past two years in the following table it is found that the percentage of cloudy weather was much less for the last twelve months than during the previous year:

Character of weather from October 1, 1907, to October 1, 1909.

Month.	Clear days.		Partly cloudy days.		Cloudy days.		Days on which rain or snow fell.	
	1907-8.	1908-9.	1907-8.	1908-9.	1907-8.	1908-9.	1907-8.	1908-9.
October.....	6	7	7	11	18	13	15	13
November.....	10	1	0	11	20	18	15	20
December.....	7	5	2	18	22	8	13	14
January.....	7	5	15	19	9	7	16	9
February.....	10	2	11	20	8	6	15	12
March.....	6	1	10	21	15	9	15	18
Total for 6 months.....	46	21	45	100	92	61	89	86
April.....	0	2	16	24	14	4	17	11
May.....	1	3	16	23	14	5	27	16
June.....	5	3	15	19	10	8	9	16
July.....	0	1	12	23	19	7	21	13
August.....	7	8	13	13	11	10	16	17
September.....	3	8	20	11	7	11	15	15
Total for 6 months.....	16	25	92	113	75	45	105	88

For the growing season, 25 days were clear, 113 partly cloudy, and 45 cloudy for 1909, while for the growing season of 1908, 16 days were clear, 92 partly cloudy, and 75 cloudy. The days designated as partly cloudy were usually sunny days with only floating clouds. The growing season was warmer this year than last by several degrees. On the whole, the year has been favorable for stock raising.

GRAIN HAY.

Owing to the lateness of spring, it was impossible to work the ground for spring crops until May 19 where the soil was sandy and June 1 on the heavier clay loam soils. At Calsinsky Bay oats were seeded May 1 in a sandy soil on land that had been lying idle for two years. The plat had formerly been a garden. A heavy coat of manure was spread on the plat before plowing. The oats came well, but grew very slowly for the first month. By July 20 the oats stood from 8 to 10 inches high, were of good color, and fairly uniform. From July 20 to August 31 the growth was most rapid, and the oats were headed out and in bloom and stood from 22 to 28 inches in height. There was not the uniformity in height noticed earlier. Frost caught the oats in the milk September 21, and a killing frost damaged them on the 26th, when the oats were cut for hay. The yield of hay was fair, but the oats were not well filled, due perhaps to the lateness of the season. At Kodiak, on clay loam soil, where the field was on the southern slope of a hill, the ground was too wet to work before June 10. A small plat was plowed on that day and seeded to oats. This plat of ground was broken up the year before and had produced but one light crop of potatoes. After seeding to oats, one-half of the plat was given a surface dressing of manure. A good stand of oats came

on the entire plat, but the growth was very slow until after July 24, at which time the oats were 3 inches high. They made a rapid growth through August where manure had been used, and very little growth where the soil had not been manured. On September 7 the oats were heading at 20 inches height on the manured plat, but where manure was not used they were only 6 to 8 inches high and very spindling and uneven. On September 27 the oats were fully headed on the manured plat and stood 25 inches high, while those on unmanured ground were from 8 to 10 inches high, very uneven, and but a few small heads. On this date the oats were cut for hay. Where manure was used, the yield was fairly good.

Sand spurry was seeded at Calsinsky Bay on May 1 on a well-manured plat of beach land. The stand was too thick for the best results, but the growth was rapid and the yield of forage was good. August 15 the spurry stood 12 to 15 inches high, at which time the milch cows were turned in to pasture on it. They ate it with relish and in preference to grass on which they were allowed to run at the same time. For a month the cows pastured on the spurry until it was eaten close to the ground.

Turnips seeded on the same kind of soil did not yield anything to speak of, but where they were seeded on heavy clay loam soil the yield was exceptionally good this season.

Ruta-bagas grew well and gave good yields.

Very little work was done with growing root crops, owing to the lack of ground under cultivation, but enough to warrant the growing of such crops for dairy feed. Several acres of land will be ready for cropping next season, and more will be broken up as fast as possible.

The dairy building will be equipped with sufficient machinery and apparatus to profitably conduct a small dairy. The equipment consists of a cream separator, a 15-gallon barrel churn, a butter worker, a Babcock tester, and a cheese-making apparatus consisting of a small vat 30 inches long, 15 inches deep, and 16 inches wide, an automatic spring cheese press, and a two-burner oil stove for heating purposes, all of which were described in the annual report for 1907.

The lack of a dairy building and equipment has necessarily delayed the dairy work for the season. Only three cows have been milked during the summer. Two of these cows had aborted at five and eight months, respectively, and neither of them were good milkers, but each has given milk for over five months and is still milking. The other cow milked this season is one of the best milkers in the herd. A careful and complete record of this cow's performance has been kept. Her calf was put on a native cow for raising. Another year about 15 cows will be selected from the herd for milking, and from the best of these selections will be made for the foundation of a dairy herd of Galloways. The heifers from the more promising cows will



FIG. 1.—A PORTION OF THE GALLOWAY HERD AT KODIAK.



FIG. 2.—SILO, BLACKSMITH SHOP, AND HERDER'S COTTAGE, CALSINSKY BAY.



be milked at their first calving, and any that show fair milking qualities will be kept for the dairy herd. The others will be sold for beef producers to the settlers and natives.

The main objects of these experiments are to develop a good milk strain of Galloway cattle for Alaska and to aid the settlers in stocking the country with a very hardy breed of cattle especially adapted to the climatic conditions under which they must live.

So far the Galloway cattle are proving their adaptability to the climate and are great rustlers in winter for feed. (Pl. X, fig. 1.) Those born in this country are perhaps the better rustlers, as they have never known any other conditions, but all the cattle shipped from below are fully acclimated now. Their long black coats of hair are heavy during the winter months and afford good protection from the rainy weather. There are no better beef producers known in any breed, and when their milking qualities are improved the Galloway cattle will be a great boon to the Alaska settler. The experiment undertaken by this station is no small one and will take years of most careful and rigid selection in breeding to develop the Galloway into a dual-purpose animal.

At all times there will be pure-bred bulls from the better milkers for sale to the settlers at reasonable prices, so that all may be benefited by the result of this work, and thereby improve the so-called native cattle and such other cattle as have been brought into this country.

THE STATION HERD.

The entire herd was wintered on native feed, hay made from native bluetop, and silage made from beach grass. Those that wintered through on hay and silage were in fair condition when grass came. Those that wintered through on hay alone were very thin, and had to be fed on grain for three weeks before grass came. The winter was long, and all browsing was cut off from December 14 until April 15. An exceptionally heavy snowfall covered all grass and most of the willows and small brush for the most of this period. The cattle had to depend upon feeding entirely from December 14 to April 15, when a little beach grass could be had where tides had melted the snow. The cattle were fed silage until April 28, and then they got their living from beach grass until June 1, when they were put on upland pasture. During the fall and up until December 14 the cattle held their flesh well on grass alone. On a few stormy days they were fed dry hay in the barn. Hay was fed at the stack during the first week of February, and beginning on February 5 silage was fed at night and hay in the morning. This order for feeding was kept up for a while and then reversed, and hay fed at night and silage in the morning. The cattle were fed for the greater part of the time in

the open barn. The daily ration of hay alone was about 25 pounds, and when hay and silage were fed together the daily ration was 10 pounds of hay and 20 pounds of silage, until about March 1, when the hay was cut off and silage fed alone, the ration being increased to 45 pounds of silage. All of this time the cattle ran on the beach, where they could get more or less kelp as it was thrown up by the tides and the waves in windy weather. At times there would be a considerable quantity of kelp, and in calm weather there would be but little. The cattle were watered at a swift mountain stream which kept open all winter.

The cattle were thriving very well until March 15, when the weather became warmer and the snow began to melt off the more exposed slopes at the foot of the high cliffs along the beach running 2 miles in a northeasterly direction from the station buildings. Here the snow melted off the beach grass, which was long and tough. The cattle got a taste of this grass, and followed up the beach for more. The following day the cattle went still farther and ate their fill of dead beach grass. The man in charge thought nothing of this occurrence as the cattle had been free to run on the beach all fall and had fed on beach grass until it was covered with snow. March 17 two of the cattle were ailing and died of impaction a few days later. Salts were freely used, but to no avail. Other cattle became sick and the supply of Epsom salts ran out. To make matters worse, a heavy snowstorm began March 25 and lasted until March 30, making it impossible to get to Kodiak for medicine or help. The writer made a trip to Calsinsky Bay April 1 and found several head suffering from impaction, and three more dead cows. Epsom salts and castor oil were received next day, and all the ailing cattle were drenched twice daily, followed with castor oil the second day. Enemas of warm soapy water were used on all. Several of the ailing cows were relieved for the time being, and four fully recovered. Thirteen cows, all in calf, died with impaction, or from the results of impaction, and two bull calves. The trouble seemed to affect the cows in calf while those not in calf escaped. Post-mortem examination showed all to have impaction either of the manifolds or the rumen.

Eleven calves were added to the herd this season. One bull was sold for breeding purposes and one calf killed for beef.

Precautions will be taken against possible losses by impaction another winter. Fencing is progressing nicely, and the cattle will be confined in pastures where there is nothing to cause impaction during the danger period.

Owing to lack of hay and means of transporting hay from Calsinsky Bay to Kodiak, only three cows, six bull calves, and two old bulls were kept at Kodiak during the winter. The bulls were allowed to run in the woods without feed until January 15, at which time they

were growing thin. Practically all the grass in the woods was covered with snow. These bulls were fed hay alone until March, when the scarcity of hay made it necessary to feed some grain. The bulls were thin when grass came, but readily gained flesh and made good growth during the summer. All the cattle are fat and pasture is still good at this date, October 1. The prospects are better for the coming winter than ever before. The cattle barn will be much more comfortable than last winter, and with 100 tons of silage and 75 tons of hay the cattle should winter well. (Pl. X, fig. 2.)

The needs of the station are as follows: Three more horses, a good wagon, two silos, and stock platform scales, in addition to the present equipment for putting up hay and silage. When these are provided the work of the station can be carried on to advantage and with good results.

The superintendent most heartily recommends the purchase of the needed equipment.

REPORTS FROM THE SEED DISTRIBUTION.

Through the cooperation of the Bureau of Plant Industry the experiment station has again distributed seed during the past season to settlers in Alaska. The letters which follow are reports from a few of those who have received seeds. Some of the letters refer to last year's crops. They were sent too late to be incorporated with the report for 1908, but since they are of interest they are submitted herewith.

Helen Althouse, Hollis, Alaska, November 22, 1909.—I want to report on my crop the past summer, which was favorable though with too much rain. The turnip seed sent did quite nicely and are the best turnips we ever ate. Potatoes raised on high ground yielded well, but those raised on low ground were good but quite small. We had an abundance of raspberries, for which we thank you. I brought some roots of the wild blackberry that grows on the Sound home with me two years ago this coming April. They bore this past summer and we think they will do fine here; they are such a rich berry for canning. The garden peas did not bear well. I find the Tom Thumb pea does the best in this climate as they mature more quickly. We had some onion seed sent us from the east and the onions grew to be an inch thick, the first onions we have ever been able to raise here from seed. My flowers were very fine considering there was so much rain. I had the finest collection of poppies everybody said that saw them. I sent several large boxes of them to Ketchikan to different ones and they said they never saw such a fine display. I am going to try growing tulips this coming spring. I have my order in now for bulbs and will put them in the ground as soon as they get here, and they will bloom in the spring. We have 4 feet of snow here at the present time and still snowing. I am afraid we will lose all of our deer between the hard winter and wolves, for the wolves are terrible, there are so many. I wish Congress would pass a bill giving a bounty, then people would hunt them. For in time, and a very short time at that, they will have all the deer killed. I guess there are only about three people here now that want seeds, as the old timers are either dead or moved away. Loys Whitcombe and ourselves are the only ones here that plant. Thanking you for past favors.

M. Madison, Shelter Island, Alaska, October 11, 1909.—I am rather late but I will tell you now. We got 30 potatoes from you, 6 each of Freeman, Garfield, Irish Cobbler, Ohio, and Norway No. 1. They were planted in good soil about May 12, with the following result: Freeman 60 potatoes weighing 15 pounds; Garfield 70, 16 pounds; Irish Cobbler 90, 17 pounds; Ohio 80, 13 pounds; and Norway No. 1, 80, 11 pounds. I think we can make them grow better next time. We will send you one of our "pride" potatoes, always a good one, a potato that will make 1,000 bushels per acre if cultivated right. Would like to know what kind it is; please let us know the name. One hundred and fifty square feet yielded 250 pounds, the highest. Please send us some of your best kinds of potatoes for trial, if only one of a kind, so that we will know what we have. There is as great difference in seed as there is in soil and even more. We also have a very bad kind of potato, late in spring and tops are early faded.

D. W. Burridge, Juncau, Alaska, September 25, 1909.—You sent me some round turnip seed last spring and asked me to inform you as to their quality. They are good; I raised about 3 bushels. I saw a very few eaten by worms; their quality is the best. I planted nearly all the seed you sent me in new ground and it all grew. Some did not thrive so well and some did the best in the country. I have ruta-bagas which would be of good size in any country. I bought 100 crab apple trees from South Dakota. They are all growing well and thrifty; and 6 cherry trees which are looking fine. The rhubarb is looking fine and I will plant it in the patch this fall. I have about 3 acres cleared of brush and partly set in grass.

F. R. Falconer, Klukwan, Alaska, October 1, 1909.—You will be interested to know that 4 pounds of government seed potatoes (Garfield) planted by an Indian in this village have yielded 100 pounds of fine large tubers. Six of these potatoes weighed 138½ ounces. There were few small ones, all being of a fairly uniform size. There are other crops yet to dig. I would like to ask what is lacking in soil which yields an overgrowth of potato vines with small potatoes. The ground in question has been in potatoes six consecutive seasons. As fertilizer we have used, at different times, hardwood ashes, rotten fish, and a small quantity of horse manure. Thanking you for what information you may give in this matter.

Mrs. A. J. Meals, Valdez, Alaska, December 31, 1908.—Out of eighteen apple trees received in the spring of 1906, three have died. While some have not grown much, others have grown a good deal considering the amount of time they had to grow, as it was early in June this year before any buds appeared. The three kinds which we have are the Siberian Crab, Yellow Transparent, and another variety which is either a Hyslop or Peerless. The growth of each was very much alike, varying from 3 to 27 inches with an average new growth of about 13 inches. The trees as they now stand vary in height from 11 to 44 inches, with an average height of about 26 inches.

Red raspberries: Out of ten bushes received in 1906 two have died. New stocks grew very fast this year, varying from 10 to 50 inches, with an average of 35 inches. Had some blossoms but very little fruit.

Red currants: Out of fifteen bushes received in 1906 three have died. The new growth this year varied from 6 to 28 inches, with an average of 16 inches. Four bushes bore fruit. The berries were medium sized and had a good flavor. We have not tried cherries as yet, but see no reason why they should not do as well as the apples. I also think the gooseberry and black raspberry would do well here.

Strawberries: The strawberries are native of Katalla, Alaska. They were planted the spring of 1907. They had a number of blossoms and some fruit, and also a number of runners. We set some of these out this spring. They also had quite a few runners which we did not disturb, neither did we disturb this year's runners on the old plants. The older plants were white with blossoms while the younger ones had only a blossom here and there. The berries, of which there were quite a few, ripened very uneven, but were large and had an excellent flavor.

Potatoes: The potatoes are Salzer Six Weeks. We have planted them every summer since 1903, keeping enough seed to plant the next year. Those planted in a light, sandy loam yielded at the rate of 220 bushels to the acre, about 75 per cent being medium sized, while those planted in a heavy clay-like soil yielded at the rate of 205 bushels to the acre, about 50 per cent being medium sized. Many of the largest were rotten or had a black streak through the center. They were planted June 1 to 5, and by the middle of July we had new potatoes.

Cabbage: The cabbage, which is Jersey Wakefield, did splendid, being very tender and having a fine flavor. We raised about fifty heads of it which were as white and solid as any cabbage.

Cauliflower: The cauliflower, which was an early variety, had medium sized heads which were as white and tender as could be.

Carrots: The carrots were tender and had an excellent flavor and it took no expert to tell the difference between them and those raised in the States. Of the three varieties, the Oxheart, Chantenay, and the Long Orange, the Oxheart and the Chantenay are the best as they grow quicker and have much more meat than the long carrot.

Turnips: The turnips, like the carrots, were tender and sweet. The Purple Top was the best, but all varieties, including the ruta-bagas, did well.

Beets: Our beets went to seed, but one of our neighbors had fine beets.

Lettuce: We had all kinds of head lettuce; was white and solid like cabbage.

Celery: We had no place to start the plants this year, but last year it did well and we had some that was quite nice.

Radishes: All varieties of radishes that we tried did well.

Onions: Onions, which were mostly from the sets, did excellent, but we had some fine onions from the seed.

Rhubarb: Rhubarb which was started from the seed is doing fine.

Horse-radish: Horse-radish is doing well, only it is not quite so strong as horse-radish raised in the States.

Peas: The peas, which are Salzer Scoreher, grew to a height of from 8 to 10 feet and furnished a goodly amount of fine peas.

Parsnips: The parsnips did well, growing to a medium size, and like all other vegetables grown in Alaska were very tender.

Parsley and spinach: Spinach and parsley both did well, the latter being very tender and savory.

Pumpkins: Pumpkins which were planted from 7-year-old seed grew till they blossomed, then the frost got them.

Flowers: Pansies, sweet peas, daisies, nasturtium, bachelor buttons, poppies, sweet william, etc., do excellently.

Grasses: Clover and timothy do very well. We had about a tenth of an acre in clover and it grew very well, but some horses broke in a couple of times and ate it all down so that we could not tell what the yield would have been. We tried some Russian millet, but it was a failure.

Mrs. John Hirshey, Hope, Alaska, October 14, 1909.—The Petrowski turnip has turned out to be a very good eating turnip, but the root maggots have bothered pretty nearly as badly as with the other turnips. All the gardens have turned out very well this season. Thanking you very kindly for the seeds.

Alex. Friedolin, Afognak, Alaska, October 6, 1909.—With the seeds you sent me I had usual success. The season was rather late for planting, but during the summer it was favorable weather for growth, especially for potatoes. First killing frost appeared in the latter part of September. The apple trees made a very good showing, the best showing of all years past. Some grew 12 inches and more. Currants had few berries, but raspberries had only flowers.

Cattle and vegetables on Sannak Island, Peter E. Nielsen, October 18, 1908.—I have experimented with all kinds of seed, and find that with proper care and culture we

can grow almost any vegetable suitable for this latitude. The principal vegetables which have grown here successfully are the following: Potatoes, carrots, parsnips, turnips, ruta-bagas, celery, parsley, lettuce, kale, mustard, cress, cauliflower, and rhubarb.

The following are vegetables grown here, but with less success: Cabbage grows too slowly, and after starting to head it bursts open and looks like a tobacco plant. Salsify grows to $\frac{3}{4}$ inch thick, but short and full of small side roots. Beets, largest grown 2 inches in diameter, tends to run up to seed. Onions also grow slowly and hardly form any bulb, the largest being $\frac{3}{4}$ inch diameter. Leek does not get large enough to use before September. Beans come up, but turn yellow and die. Peas grow rank and do not bloom before the middle of August and pods are not suitable to use before latter part of September. I believe that all these vegetables mentioned can be grown successfully with proper fertilizing and draining, but there is no market for anything of this kind, consequently subsistence must be made otherwise and we have not time to spare to attend to it properly. We just grow enough for our own use.

Cattle have increased considerably the last few years. Here is a herd of about 100 head (owned by five different parties) at present, as against 12 head in 1900. During this time 25 head have been slaughtered, and about 25 head lost in swamps and by falling over bluffs and other mishaps. This loss could be cut down to about half if proper care were exercised. Experience proves that cattle must be housed during cold spells in winter, especially the young stock, and sufficient fodder had on hand. Last winter proved to be the hardest on cattle for the last eight years. The spring came very late and the grass did not grow much before the middle of June. I am afraid the cattle will degenerate in course of time if we do not cross the breed with some other stock. I have been informed that by applying to your department I might have a chance to buy a bull calf of some good breed of cattle from one of your experiment stations.

F. H. Spence, Jesse Lee Home, Unalaska, Alaska, September 30, 1909.—I am pleased to be able to report to you some improvement in results at Unalaska this season. We had a very cold June, but since then we have had an unusual amount of sunshine and very little rain. Lettuce, radishes, turnips, and kale have done well this year. Have made some experiments with very satisfactory results. Last fall I turned over some sod and let it rot until this spring, when I turned it over again. Lettuce, radishes, and kale sowed in this soil made a remarkable growth. I never saw any finer or more healthy in the States. In the same ground I sowed red clover and alfalfa that made an astonishing growth for the first year. We also sowed oats that made as tall a growth as in the States and some of it has headed out. We are now assured that we can raise tame grass sufficient to fill a silo and furnish coarse feed for cattle during the winter. I am turning over sod in a valley protected from the north, east, and west winds and sloping gently to the south, where I hope next year to raise larger potatoes and onions from onion sets, etc. I am satisfied we need to use the sod here to get the best results and that fertilizer is also of benefit.

Joseph L. Brown, private experimental farm, Unalaska, Alaska, October 2, 1909.—The land which I have been experimenting upon was an original sod until May 1, 1909. We broke some of this sod the 1st of May and worked some of it down and sowed oats May 15, 1909. These oats headed in August, being about 30 inches high. I cut the most of them the last days of August and put them in silos at the Jesse Lee Home and at Dutch Harbor and will try to see how well they keep as food for cattle. At later dates we planted potatoes which were not a success in the sod, although we had a few potatoes. We sowed turnips at different times and have a fine crop. I am safe in saying that we have 50 bushels of turnips on one-third of an acre. The onion sets which we planted made fine table onions, but did not ripen. Rape, lettuce, radishes, and mustard were a grand success. Cabbage, cauliflower, beets, parsnips, celery, and kale have been only a partial success on the sod, but I think they may

be better when the ground is fully cultivated. Clover and alfalfa sowed in June are growing nicely. Wheat and rye sowed the first of September are looking fine. We have 6 acres of sod broken and fenced. The North American Commercial Company, on whom we have been depending for a team, may abandon this place in the event that company does not release the seal fisheries, and in that event we would have to look elsewhere for a team. I think there should be an appropriation for this purpose so that this work might be carried out more effectually. As it is, our means are quite limited.

Rev. J. H. Schoechert, Moravian Mission, Quinhagak, Kuskokwim River, Alaska, December 9, 1908.—A nice lot of seed was received with our last mail. They will be distributed among the settlers and natives here, i. e., as far as they will go. We have nothing special to report regarding crops this year. Though the summer was fine, it was too dry the first part of the season; nevertheless, had a fair crop. The climate here on the coast of Bering Sea at the mouth of the Kuskokwim, or rather bay, does not seem warm enough to make a business of raising garden truck. Flowers and such plants as are kept in houses and the hothouses do splendidly; also turnips, radishes, cabbage, potatoes, and ruta-bagas, but beets, cucumbers, and such like will not thrive unless they are kept under cover.

Rev. S. H. Rock, Bethel, Alaska, August 31, 1909.—The package of berry plants sent me for planting here came to hand just a short while ago. Unfortunately the moisture in the moss had all been evaporated and in consequence the life of every plant was extinct. I regret very much that the plants could not be tried. We have a variety of currants here and raspberries a little farther inland. If you will try to send me some more plants, maybe they will come through quicker and in better condition. Could you not put some special "hurry through" label on package. This has been rather a favorable season for gardens. All vegetables promise a bountiful harvest. Potatoes are fine. We had some of the finest cauliflower again, very large and white and solid. Ruta-bagas, kohlrabi, peas, and flowers are all doing their best. Hoping to hear from you again and thanking you for any advice you can give.

Rev. Adolf Stecker, Bethel, Alaska, November 9, 1908.—Reporting about our gardening in the last summer, I can be very short. Everything has grown very well, and we have had a good harvest of potatoes, cabbage, ruta-bagas, turnips, carrots, and lettuce, and besides we had nice flowers, some stocks we have even now in full bloom in our room. We had in the latter part of August a little frost, just so that we saw a few brown spots on the potato leaves. When we had that frost, the potatoes at Quinhagak (100 miles down) had been frozen to the ground, and so also in Ogavik (80 miles up river).

In the cabbage and turnips we had some trouble with worms, but not so much as the year before. The Lapps sent a turnip down from the mountains; it weighed 2 pounds, and one beet which weighed 1 pound. The summer here was certainly excellent, without storm or much rain and very warm, just as if made for gardening. Yet, although the summer was warm, we have seen very few butterflies.

Of the young trees, 15 apple trees and 7 currants have been growing. Many white men have asked for seed, and I have been glad to be able to give them of what you sent for distribution. I told them also to report to you.

Thanking you very much and wishing you much success in all these efforts to help Alaska.

Rev. John W. Chapman, Anvik, Alaska, September 21, 1909.—The present has been a good gardening year at this place. Potatoes, ruta-bagas, cabbages, carrots, and beets all did well. From something less than half an acre we raised 1,600 pounds of potatoes, 200 pounds of cabbages, and 200 pounds of ruta-bagas and turnips. The Petrowski turnip turned out well. If its keeping qualities are as good as ruta-bagas it will supplant the latter with us, as a surer crop, remarkably fair, a good yielder, and not in the least defaced by worms, and rather better in flavor than the ruta-bagas.

I promised to write you my experience in keeping cattle. I have a grade Durham, which we have kept for several years. She never gave us any trouble whatever, in the way of keeping her, sickness, etc. She gave us 2 tons of milk the first year by actual test, and has given about the same each year since. In summer she and all her calves get fat quickly, and in winter they keep in good condition when fairly treated. She is fed a moderate amount of grain. Grain will mature here sufficiently to be fed as hay, but so far we have imported our grain. We cut the native hay—\$10 per ton. The cow of which I am speaking has given us four calves in as many successive years, the last one of which is a heifer. I would not ask any better stock than the old cow. She is perfectly hardy. I imported a pure-bred Holstein bull and cow from California, but had no success with them at all. They were ailing all the time. The bull died of pneumonia. The cow had inflamed udders and was otherwise unsatisfactory, being sick nearly all the time we had her. She was so unprofitable that we finally killed her. I have no reason to think that they were not good stock. They had both been tested for tuberculosis and pronounced free from disease. I shall not repeat the experiment of getting finely bred stock. I am now looking for another good grade Durham. Thanking you very much for the valuable Petrowski turnip seed, and with best regards.

Rev. Jos. Perrent, Holy Cross Mission, Koserefsky post-office, Alaska, December 24, 1908.—I am happy to send you a fairly favorable report of the farming done here for the season of 1908.

The crop of hay, about 40 tons, is one of the best we have ever had. The oat crop, too, is good, about 6 tons, though it did not ripen. The vegetable crop is as follows: Potatoes, 500 bushels off 3 acres; turnips, 50 bushels off $\frac{1}{2}$ acre; carrots, 6 bushels; cabbage, magnificent; cauliflower, never so nice before; beets, better than usual; celery, very good; rhubarb, large supply, good quality; ruta-baga, poor; radishes, could not be better; onions, did not grow at all; tomatoes, reached a good size, but did not ripen; a great variety of flowers in abundance.

We improved our meadow, which formerly was a lake, by straightening the sides and filling in the holes. We also burned some of the old grass so as to permit of our using the mower next year all over the meadow. We ploughed about 3 acres of new soil.

A. H. Meinzer, Eagle, Alaska, October 2, 1908.—I received the seed you sent me a year ago, for which I thank you. Planted seed of cabbage, kale, Brussels sprouts, celery, and cucumbers in box in house on April 2, after putting them to soak for three hours. Came up in a few days and grew about 4 inches high and withered. I think my cabin was too dark. Having more seed to soak than boxes would hold, put them in box outdoors and would cover them at night. The cabbage and kale grew so that I could use them for greens (Early Winningstadt and Early Jersey Wakefield cabbage, Curled Dwarf Green Scotch kale). Black-seeded Simpson lettuce did very well, leaves 11 by $13\frac{1}{2}$ inches. Red Top Strap Leaf turnips did well, 6 to 7 inches in diameter. Early Scarlet Turnip radish did not come up. Ruta-bagas grew very slowly and did not get very large. Kohl-rabi, large white, grew quite well. Beets, Crimson Globe and Dewing, both did very well. Parsnips did not come up. Carrots, half large stump-rooted Chantenay did very well. Parsley did not come up. Onions, Yellow Danvers, did not come up. Spinach did not come up. Rhubarb, Victoria, did very well. Beans, Red Valentine, grew slowly and never bloomed. Peas, Alaska and Nott Excelsior, both did well; Alaska was the earliest. Potatoes, 132 pounds from 10 pounds seed, began using some August 10. The soil is a black muck, about 2 to 4 inches deep, but by gathering it up into beds about 10 inches deep it did very well. This also killed all the weeds and let the surrounding ground warm up. Used horse manure. Had no frost to hurt anything until September 6. Other gardens not far down stream were nipped in August. Have shoveled top soil

in heap by the side of beds this fall. Will try if warming up slide before replacing garden soil again will not prove better. Thanking you again for seed.

Al. Maxey, McCarty, Alaska, December 12, 1908.—I received your package of seed in the spring and planted most of them. The beans did not come up at all, but the peas did well. Cabbage was planted on new ground and did not do very well. Beets did well and also carrots. Your oats and barley did fine; some parties who saw them said they would make at the rate of 60 bushels to the acre. Some of them got ripe enough to be planted next year. The Russian Black oats were more than waist high, and the Swedish oats were up to my shoulder, about 5 feet. The barley was about the same height. Turnips did well, also ruta-bagas. I raised about 5½ tons of potatoes and 3½ tons of ruta-bagas. I planted quite a patch of winter radishes. They grew large and crisp, but went to seed before fall. I planted a patch of stock carrots and mangels on new ground. They did not do much. I am going to try them again next year. I have a ton of white fish and a ton of salmon; some parties tell me that to put them in the ground green in the row between the vegetables will do good. Have you had any experience with them, or should I mulch them or burn them to get best results? I have about 5 acres of ground clear of stumps which I will have in cultivation next season.

Lewis Lloyd and A. D. Wilcox, Shungnak, Alaska, October 16, 1908.—Inclosed please find report of gardens of Lewis Lloyd and A. D. Wilcox, at Shungnak, Alaska. In regard to the Swedish turnip, this did well and is a good turnip for Alaska, as good as the Red Top Strap Leaf. The Iceland turnips did not grow very large; in fact they seem to be somewhat too slow for the climate. Every season we have good results from the Red Top Strap Leaf turnip, and must say that the round Yellow Swedish and the Red Swedish turnips are very good for this northern climate, as they matured as well as the Red Top Strap Leaf. We also tried the ruta-bagas along with the Iceland, but failed to get good results. The kohl-rabi did well this season, also cabbage, and three kinds of lettuce did well also, but the black-seeded Simpson lettuce is the best for here and gives best results. We have failed to get beans to mature three seasons. Beets turn out well every year, and this year we have a nice big patch of rhubarb from United States Government seeds. Had rhubarb for pies this fall from seeds started in boxes in April. The patch promises good for next season. We have vegetables stored away for the winter, all kinds of turnips, beets, carrots, and cabbage. Anything that we can do for the good of the Department we are at your service to do, and any seeds you wish us to try for you and report on we will be glad to test, only send seeds in time, and most kindly oblige.

Lewis Lloyd and A. D. Wilcox, Shungnak, Alaska, June 22, 1909.—Shungnak is a small mining camp on the Kobuk River at a point or near a place marked Riley Camp on the maps. Shungnak post-office is located about 12 miles easterly from Riley Camp on the Kobuk River, and is about 250 miles from Kotzebue post-office at Cape Blossom, and about 30 miles north of the Arctic Circle. The nearest town or post-office to Shungnak is Kotzebue, a trading post and missionary station, and the nearest town, if we may call it such, as it is small, is Cornelle. At the present time of writing I am pleased to let you know that the garden all promises well for the season. We will have about 40 gunny bags of turnips, 10 gunny bags of beets, 300 head of cabbage, 400 of celery, a few dozen kohl-rabi, and about 4 gunny bags of onions. The potatoes I can not guess at at present, nor the cucumbers and tomatoes; will let you know later. We have about 200 rhubarb plants that are growing fine. We would like to know where we could buy about half pound of Petrowski and Yellow Swedish turnip seeds. They are good producers and good keepers and the best for the Arctic country so far.

Lewis Lloyd and A. D. Wilcox, Shungnak, Alaska, August 14, 1909.—The gardens here promise well up to the present time, and I wish to say that Mr. Wilcox and I will have about 20 gunny sacks of potatoes. The cucumbers are maturing fast, but are

under glass and not out of doors like the rest. Rhubarb is doing well here now. We also have several good hardy strawberry plants from seeds and 11 apple trees doing well. There are two gardens on the United States school reserve doing well with turnips, cabbage, radishes, lettuce, rhubarb, potatoes, and other truck. Charles Coffin has a fine vegetable garden this year, also Michael Tuohy, Thomas Shea, F. Knight, L. Coverley, G. Ostenruck, and some others. Vegetable growing here is only in its infancy; this place will grow lots of vegetables in the near future. Mr. Wilcox and myself raised 74 pounds of the Yellow Petrowski turnip seeds. They are getting matured and we will plant the same next season. Our Early Jersey Wakefield cabbages are a wonder this year, fine solid large heads. We had fresh vegetables all winter in the root house, some lasting until the latter part of June this year.

Frank E. Howard, Coldfoot, Alaska, July 20, 1909.—Each succeeding season I seem to have better success in gardening, which seems to be a wonder to all the newcomers who drop up here. I have made a success of growing green table onions, which I began to pull over two weeks ago; also celery. My cucumber plants died for reason of too much rain in the early part of June. I have 5 hills of tomatoes, the plants being about $2\frac{1}{2}$ feet high, with heavy stocks, and now beginning to blossom. In no instance do I raise anything under glass, but my tomato plants are shielded from the north winds. My cabbages are now well along in heads, and I will be eating cabbage in a few days. I have had a few messes of fresh potatoes, some as large as eggs, and the vines are now well along in blossom. A small patch of oats, wheat, and barley, mixed, is now in the head, and I believe the grain will ripen, if the mice do not clear out the patch.

CLIMATIC RECORDS FOR 1909.

The following tables give the character of the weather, to the extent it can be expressed in condensed figures, for the months named under each place of observation. A similar record was published in last year's report, and this record begins at each station where that of last year ended, as has been the case in former reports, so that the series of reports will give a continuous record. The records are, however, neither continuous nor complete for all stations. There are too many and too extended interruptions, in many cases caused either by the temporary absence of the observer, or by his removal from the place, or by the breaking of instruments, often leaving long intervals before new ones can be furnished, especially at interior points, due to the fact that packages can not be carried in the mails except during the four months of river navigation. But with all the deficiencies, the records nevertheless afford the student of the weather a fairly good idea of its character.

The Alaska stations are indebted to the Chief of the United States Weather Bureau for his cooperation in the collection of these data. The Weather Bureau furnishes the instruments and is in turn supplied with copies of all reports received. The Alaska stations also tender their grateful acknowledgment to the many faithful cooperative observers for their assistance in collecting these data. It is a valuable public service. It is due to their willingness to assume

responsibility for the instruments and to their interest in the work that it has been possible to obtain records from so many and so widely scattered places. An accurate record of the weather, faithfully kept for each day in the year, is not only of much scientific interest, but of great practical value. It will enable future settlers to foretell the measure of success in crop growing and stock raising which can be attained in each region covered with such a record. If, for instance, the records show that the minimum temperature does not fall below the freezing point before early September, he will know that his crops will be safe from destruction by frost. From the maximum and mean temperatures during the growing season he can judge of the crops which can be grown and brought to maturity, and the amount of precipitation informs him whether or not the rainfall is adequate for the production of crops and pasturage. Indeed, accurate and complete data on the weather conditions are of vastly more importance in Alaska than are similar data farther south, for the reason that we are here on the border land of possibilities in agriculture. Success or failure depend wholly on the character of the weather. The observations which the public-spirited cooperative observer now places on record will stand to his credit through all time, and generations hence he will be quoted as authority wherever students seek information on Alaska weather.

As to the records herewith submitted, they are of necessity greatly condensed for lack of funds and space to publish them in full. The temperatures in the column headed "Maximum" are the highest temperatures for each month, respectively, and in like manner the minimum given is the lowest for each month, while the "Daily mean" is not the average of the maximum and minimum herein recorded, but the average of the means for each day in the month. The precipitation includes both rain and melted snow. The weather conditions are indicated by the number of days in each month of clear, partly cloudy, cloudy, and rainy weather. The number of days in the last column headed "Rain or snow," credited to each month, does not mean that they were rainy all day, but simply that rain or snow fell on that number of days. A day may be rainy part of the time and the sun may shine during part of the time, and it will then be classed as both rainy and partly cloudy. All temperatures are in degrees Fahrenheit.

Condensed meteorological reports.

SITKA: Lat. $57^{\circ} 3'$, long. $135^{\circ} 20'$. Experiment station, observer.

Month.	Temperature.			Total precipitation.	Weather conditions (number of days).			
	Maxi-mum.	Mini-mum.	Daily mean.		Clear.	Partly cloudy.	Cloudy.	Rain or snow.
1908.								
November ^a	56	22	40.60	7.22	4	9	16	24
December.....	48	14	36.30	9.34	9	3	19	21
1909.								
January.....	40	2	22.80	1.49	18	2	11	8
February.....	46	3	30.40	2.47	10	2	16	11
March.....	49	28	37.10	12.97	1	8	22	27
April.....	59	29	38.90	4.67	3	4	23	22
May.....	64	32	46.30	4.47	6	8	17	17
June.....	76	35	51.90	3.29	8	3	19	16
July.....	67	44	54.40	5.11	4	4	27	24
August.....	66	42	53.80	5.62	6	6	25	25
September.....	74	33	50.60	16.98	4	2	24	25
October.....	61	29	44.12	10.46	4	4	23	26
November.....	48	9	32.29	3.83	9	5	16	12
December.....	48	14	33.54	4.01	5	7	19	18

^a Record for 29 days.KODIAK: Lat. $57^{\circ} 47'$, long. $152^{\circ} 20'$. M. D. Snodgrass, observer.

1908.								
November ^a		17	.....	14.11	1	11	18	20
December ^a		13	.....	7.15	5	18	8	14
1909.								
January ^a		8	.....	1.33	5	19	7	9
February ^b	40	12	28.65	1.53	2	20	6	12
March.....	42	2	28.69	3.92	1	21	9	18
April.....	50	15	35.03	5.41	2	24	4	11
May.....	63	26	41.07	4.97	3	23	5	16
June.....	76	34	46.94	7.25	3	19	8	16
July.....	73	38	52.90	2.92	1	23	7	13
August.....	72	37	54.87	5.12	8	13	10	17
September.....	58	26	46.06	4.64	8	11	11	15
October.....	52	20	37.55	4.45	6	16	9	14

^a No maximum record.^b Maximum record for last 16 days.RAMPART: Lat. $65^{\circ} 30'$, long. $150^{\circ} 15'$. J. W. Gasser, observer.

1908.								
September.....	68	7	37.14	1.56	6	3	21	12
October.....	44	-23	19.02	.39	11	3	17	6
November.....	25	-31	2.02	.28	5	6	19	7
December.....	24	-58	-5.43	1.14	8	4	19	13
1909.								
January.....	12	-56	-25.66	.09	20	5	6	2
February.....	21	-49	-16.04	.10	22	2	4	2
March.....	37	-28	5.55	.37	10	4	17	3
April.....	50	-22	18.41	.51	17	3	10	5
May.....	76	15	43.59	1.04	15	4	12	6
June.....	83	35	57.71	.85	5	6	19	8
July.....	90	40	63.00	2.01	10	6	15	10
August.....	89	27	54.94	1.41	8	6	17	8
September.....	70	10	38.84	.36	7	4	19	5
October.....	39	-2	18.41	1.14	4	4	23	6

Condensed meteorological reports—Continued.

COPPER CENTER: Lat. 62°, long. 145°.

Month.	Temperature.			Total precipitation. Inches.	Weather conditions (number of days).			
	Maximum.	Minimum.	Daily mean.		Clear.	Partly cloudy.	Cloudy.	Rain or snow.
1908.								
October.	50	-26	17.69	1.15	17	.....	14	2
November.	45	-32	13.18	.10	6	.....	24	1
December.	40	-44	4.74	.70	1	.....	30	2
1909.								
January.	12	-60	28.06	.70	25	.....	6	2
February ^a .								
March ^a .								
April ^a .								
May.	73	24	45.40	.88	11	11	9	5
June ^b .	69	29	49.60	.72	15	4	11	4
July ^c .		32		3.44	9	7	15	10
August ^d .		31		1.27	2	14	15	.....

^a No record.^b Record first 16 days; weather for full month.^c No maximum record.^d Record for first 16 days, minimum only.

FORTMAN SALMON HATCHERY, LORING: Lat. 55° 20', long. 131° 40'. Fred Patching, observer.

1908.								
November.	48	15	37.70	17.39	1	17	12	22
December.	46	8	32.23	9.30	3	11	17	25
1909.								
January.	34	-11	13.96	(a)	11	15	5	.....
February.	41	-23	23.40	6.75	5	13	10	14
March.	47	23	35.30	14.54	.....	15	16	31
April.	57	22	37.30	5.63	3	18	9	22
May.	71	29	46.00	7.77	4	15	12	19
June.	77	32	52.80	4.98	2	22	6	21
July.	76	41	54.60	17.46	4	10	17	26
August.	71	44	53.70	16.47	2	4	25	25
September.	76	38	50.70	28.94	3	.....	27	28
October.	54	27	42.90	24.68	4	2	27	26
November.	45	5	29.80	7.41	7	2	21	19

^a Record not given.

WRANGELL: Lat. 56° 30', long. 132° 30'. George C. L. Snyder, observer.

1908.								
December.	45	6	30.60	0.67	4	.....	27	22
1909.	38	0	17.10	4.87	17	.....	14	9

CALDER: Lat. 55° 08', long. 133° 27'. Neil Walker, observer.

1908.								
November.	50	23	38.80	11.74	10	3	17	20
December ^a .	46	24	47.05	3.25	1	.....	18	13
1909.								
January ^b .								
February ^c .	45	0	29.40	2.40	11	1	14	8
March.	47	23	34.50	10.50	2	8	21	24
April.	59	24	37.70	3.58	18	5	11	15
May.	71	29	45.20	5.01	14	3	14	15
June.	72	33	50.74	6.25	6	9	15	17
July.	63	40	53.20	10.36	5	3	23	24
August.	65	41	52.00	12.68	4	11	16	23
September.	70	37	50.50	17.92	4	2	24	23
October.	59	28	42.50	16.90	4	5	22	25
November.	44	9	29.70	4.77	10	3	17	9

^a First 19 days' record.^b No record.^c Record for 24 days.

Condensed meteorological reports—Continued.

JUNEAU: Lat. $58^{\circ} 20'$, long. $134^{\circ} 30'$. I. J. Sharick, observer.

Month.	Temperature.			Total precipitation.	Weather conditions (number of days).			
	Maximum.	Minimum.	Daily mean.		Clear.	Partly cloudy.	Cloudy.	Rain or snow.
1908.								
November.....	47	25	35.60	1.82	.....	.....	30	18
December.....	39	9	30.68	5.68	1	.....	30	26
1909.								
January.....	33	— 5	14.15	.59	23	.....	3	4
February.....	40	3	25.28	3.38	26	.....	2	9
March.....	47	30	39.03	9.26	10	.....	21	30
April.....	50	29	40.61	4.04	18	.....	12	18
July.....	78	48	60.70	7.44	17	.....	14	23
August.....	70	45	57.07	11.89	5	.....	26	29
September.....	68	35	51.80	16.18	2	.....	28	27
October.....	62	34	42.09	6.95	6	1	24	27
November.....	44	5	25.11	2.69	18	.....	12	12

SKAGWAY: Lat. $59^{\circ} 5'$, long. 135° . H. D. Clark, observer.

1908.								
November.....	45	19	34.00	3.16	2	11	17	10
December.....	44	— 3	27.80	1.81	10	8	13	6
1909.								
January.....	35	— 15	4.84	.....	23	4	4	.....
February.....	41	— 6	16.60	.15	8	13	7	2
March.....	46	6	33.30	2.15	4	9	17	10
April.....	57	19	38.20	.....	7	14	9	.....
May.....	74	29	49.16	.70	9	8	14	4
June.....	84	32	54.70	.68	7	11	12	4
July.....	76	37	55.30	2.43	4	11	16	9
August.....	65	37	53.02	2.28	2	16	13	14
September.....	68	33	49.50	6.41	3	7	20	20
October.....	55	30	40.90	4.63	1	12	18	10

KLUKWAN: Lat. $59^{\circ} 25'$, long. 136° . F. R. Falconer, observer.

1908.								
November.....	43	— 3	26.78	3.06	6	5	19	18
December.....	41	— 22	19.43	1.79	10	4	17	12
1909.								
January.....	31	— 27	— 3.32	.20	22	3	6	3
February.....	37	22	9.98	.35	16	1	11	6
March.....	45	3	31.14	2.43	9	4	18	10
April.....	57	10	36.30	.....	14	6	10	.....
May.....	73	24	47.23	.79	14	6	11	5
June.....	81	32	52.18	.92	6	4	20	10
July.....	75	42	a 56.50	2.36	6	5	20	14
August.....	65	38	52.12	1.62	2	5	24	18
September.....	66	30	b 45.68	.24	3	2	25	21
October.....	49	18	36.24	2.65	3	5	23	16
November.....	43	— 20	14.69	.61	17	3	10	5

a First 15 days.

b Last 25 days.

Condensed meteorological reports—Continued.

KILLISNOO: Lat. 57° 30', long. 134° 30'. Joseph Zuboff, observer.

Month.	Temperature.			Total precipitation. Inches.	Weather conditions (number of days).			
	Maximum. ° F.	Minimum. ° F.	Daily mean. ° F.		Clear.	Partly cloudy.	Cloudy.	Rain or snow.
1908.								
November.....	50	20	36.30	6.50	8	8	22	19
December.....	44	10	32.50	1.86	4	6	21	7
1909.								
January.....	34	0	16.19	.....	6	5	20	.....
February.....	40	—6	25.05	.....	10	1	17	.....
March.....	44	26	35.70	1.13	.....	.....	.....	.....
April ^a	64	34	47.15	.25	2	9	4	2
May ^b	81	34	50.80	.55	6	11	13	5
June.....	70	42	53.10	3.15	2	8	21	13
July.....	63	42	52.80	4.50	.....	5	26	23
August.....	62	35	47.05	11.90	2	3	25	22
September.....	56	29	39.50	7.60	4	3	24	23
October.....	46	8	19.43	.25	9	.....	21	2

^a Observer absent.^b Record for 15 days.

CORDOVA: Lat. 60° 35', long. 146°. M. S. Whittier, observer.

1909.								
May ^a	64	35	45.90	6.09	9	5	12	16
June.....	74	39	50.41	14.63	11	6	13	20
July.....	71	47	56.50	4.95	6	8	17	17
August.....	67	42	54.80	8.86	5	12	14	20
September.....	61	32	47.00	19.17	4	7	19	23
October.....	49	28	39.11	9.04	12	9	10	15
November.....	42	12	23.60	1.69	17	6	7	5

^a Record for 25 days.

VALDEZ: Lat. 61° 7', long. 146° 20'. Willard S. Kelly, observer.

1909.								
February.....	47	—7	18.20	.....	8	6	14	.....
March.....	50	3	30.20	.....	12	5	14	.....

FORT LISCUM: Lat. 61° 7', long. 146° 27'. Capt. John A. Clark, post surgeon, observer.

1908.								
November.....	39	4	28.38	8.72	6	9	15	13
December.....	37	4	24.67	11.09	5	5	21	—15
1909.								
January.....	39	—12	10.87	2.29	20	6	5	.5
February.....	40	—2	32.06	2.57	18	2	8	8
March.....	41	8	26.79	5.80	11	6	14	13
April.....	49	17	33.60	6.94	14	3	13	14
May.....	63	31	41.40	6.28	13	12	6	17
June.....	79	34	47.80	6.14	10	10	10	17
July.....	72	42	54.64	5.78	15	4	12	17
August.....	71	36	50.64	6.65	10	2	19	19
September.....	59	27	43.75	6.40	8	4	18	20
October.....	47	18	33.15	2.83	14	2	15	7
November.....	47	5	23.00	.59	19	1	10	4

Condensed meteorological reports—Continued.

SEWARD: Lat. 60° 1', long. 149° 30'. W. A. McNeiley, observer.

Month.	Temperature.			Total precipitation.	Weather conditions (number of days).			
	Maxi-mum.	Mini-mum.	Daily mean.		Clear.	Partly cloudy.	Cloudy.	Rain or snow.
1908.								
November.....	49	11	33.40	20.99	9	2	19	19
December.....	41	—1	29.20	12.38	9	2	20	18
1909.								
January.....	43	—5	13.88	.52	24	1	6	4
February.....	44	2	22.20	.47	18	3	7	2
March.....	49	10	31.20	3.72	14	4	13	12
April.....	54	18	36.50	3.03	16	3	11	8
May.....	73	32	43.30	4.47	12	2	17	15
June.....	84	35	48.80	4.39	15	3	12	12
July.....	77	43	55.10	.72	12	5	14	6
August.....	75	40	55.00	3.71	15	2	14	14
September ^a	60	45	50.10	1.41	—	—	6	6
October.....	50	22	37.20	8.92	17	1	13	12

^a Record for 6 days.

SUNRISE: Lat. 60° 54', long. 149° 35'. A. Lawson, observer.

Month.	Temperature.			Total precipitation.	Clear.	Partly cloudy.	Cloudy.	Rain or snow.
	Maxi-mum.	Mini-mum.	Daily mean.					
1908.								
November.....	48	—7	27.89	4.49	4	4	22	20
December.....	42	—13	23.50	3.37	9	2	20	16
1909.								
January.....	29	—25	—1.01	.54	22	3	6	6
February.....	39	—17	10.60	1.05	14	5	9	9
March.....	49	—9	24.90	2.71	8	8	15	16
April.....	51	11	33.10	.68	13	8	9	8
May.....	68	26	43.56	2.27	13	4	14	13
June.....	78	28	48.10	1.96	10	7	13	13
July.....	73	39	54.50	1.79	11	8	12	13
August.....	70	35	52.54	3.06	8	8	15	17
September.....	61	17	42.50	2.64	9	2	19	18
October.....	45	10	29.90	2.56	12	2	17	15

TYONOK: Lat. 61° 10', long. 151° 40'. Durel Finch, observer.

Month.	Temperature.			Total precipitation.	Clear.	Partly cloudy.	Cloudy.	Rain or snow.
	Maxi-mum.	Mini-mum.	Daily mean.					
1908.								
October.....	51	10	32.53	1.30	17	2	12	11
November.....	46	0	29.05	1.21	6	5	19	8
December.....	39	—4	24.38	1.86	7	2	22	10
1909.								
January.....	33	—17	4.37	.58	23	3	5	1
February.....	42	—14	11.62	.53	18	1	9	5
March.....	47	2	25.93	.99	18	3	10	3
April.....	58	12	34.01	2.38	17	3	10	8

COAL HARBOR: Lat. 55° 24', long. 160° 49'. Henry S. Tibby, observer.

Month.	Temperature.			Total precipitation.	Clear.	Partly cloudy.	Cloudy.	Rain or snow.
	Maxi-mum.	Mini-mum.	Daily mean.					
1908.								
October.....	53	26	42.80	22.08	3	10	18	10
November.....	55	20	34.10	13.20	2	14	14	5
December.....	55	14	37.30	41.14	1	8	22	11
1909.								
January.....	53	3	28.20	5.00	3	14	13	2
February.....	40	9	30.40	3.75	4	9	15	8
March.....	42	1	25.05	2.00	8	6	17	1
April.....	49	9	34.50	6.56	7	4	19	7
May.....	60	28	40.20	3.88	2	14	15	8
June.....	74	32	46.90	1.56	2	12	16	4
July.....	80	41	53.60	2.08	3	12	16	8
August.....	72	40	54.50	2.47	6	11	14	7
September.....	58	30	43.30	1.28	2	12	17	4

Condensed meteorological reports—Continued.

DUTCH HARBOR: Lat. $53^{\circ} 54'$, long. $166^{\circ} 32'$. F. Schroeder, observer.

Month.	Temperature.			Total precipitation.	Weather conditions (number of days).			
	Maximum.	Minimum.	Daily mean.		Clear.	Partly cloudy.	Cloudy.	Rain or snow.
1908.								
October.....	50	31	39.93	8.40	3	17	11	18
November.....	48	14	33.76	9.70	.....	23	7	14
December.....	48	21	34.85	8.74	.....	30	1	27
1909.								
January.....	48	18	31.74	5.30	3	26	2	8
February.....	49	17	34.06	4.60	1	22	5	8
March.....	42	10	29.90	.....	.....	27	4	.....
April.....	48	26	36.93	3.95	1	23	6	9
May.....	49	30	39.52	4.20	.....	23	8	16
June.....	72	45	46.04	1.35	.....	27	3	7
July.....	74	37	52.11	1.39	3	16	12	5
August.....	72	28	53.17	5.33	.....	24	7	15
September.....	55	32	43.98	9.07	.....	21	9	23
October.....	51	25	40.49	20.20	.....	17	14	25

FORT EGBERT: Lat. $64^{\circ} 49'$, long. $141^{\circ} 12'$. C. E. Smith, observer.

Month.	1908.	35	-41	2.50	0.74	6	1909.	
							24	4
November.....	25	-52	-	2.70	1.09	12	.....	19
1909.								
January.....	0	-69	-40.20	.16	24	.....	7	1
February.....	-15	-51	-19.00	.07	19	.....	9	1
March.....	44	-27	8.70	.11	15	.....	16	1
April.....	53	-15	19.70	.34	13	.....	17	1
May.....	70	16	42.10	.28	14	.....	17	3
June.....	82	29	54.30	2.35	10	.....	20	6
July.....	81	33	59.80	1.77	7	.....	24	7
August.....	76	23	51.05	.95	13	.....	18	6

NIZINA: Lat. 61° , long. $142^{\circ} 20'$. George M. Easterly, observer.

Month.	1909.	65	5	38.30	3	10	1909.	
							2	(b)
April a.....	75	25	44.23	(b)	23	5	3	.....
May.....	76	30	50.10	(b)	24	4	2	(b)
June.....	74	39	52.96	(b)	18	4	9	(b)
July.....	58	34	47.35	(b)	14	10	7	(b)

a Record last 12 days.

b No record.

KENNECOTT, near Nizina. H. J. Walkins, jr., observer.

Month.	1909.	68	26	39.00	.....	19	1909.	
							6	6
May.....	80	29	47.90	.....	.....	19	5	6
June.....	73	34	51.80	.....	.....	13	2	16
July.....	.....	.....	.....	.....	.....	.....	.....	7

KETCHEMSTOCK: Lat. $64^{\circ} 15'$, long. $142^{\circ} 20'$. Michael Doran, observer.

Month.	1908.	30	-34	-1.30	.....	8	1908.	
							21	3
November.....	19	-58	-13.60	.....	.....	15	.....	16
1909.								
January.....	-3	-64	-39.43	0	19	.....	12	10
February.....	9	-54	-23.50	.....	20	1	7	1
March.....	41	-36	-4.20	.....	14	1	16	1
April.....	47	-26	14.80	0.20	16	0	11	1
May.....	70	18	41.80	0	18	3	10	0
June.....	80	24	50.50	3.67	9	4	17	13
July.....	81	28	55.30	3.39	9	.....	22	11

Condensed meteorological reports—Continued.

CIRCLE CITY: Lat. $65^{\circ} 41'$, long. 144° . George H. Mills, jr., observer.

Month.	Temperature.			Total precipitation.	Weather conditions (number of days).			
	Maximum.	Minimum.	Daily mean.		Clear.	Partly cloudy.	Cloudy.	Rain or snow.
1908.								
November ^a	41	-48	-8.35	0.75	12	4	10	4
December ^b	21	-50	-11.11	1.11	13	.....	15	5
1909.								
January ^c	7	-32	d -21.90	.44	22	3	5	2
February ^e	-3	-53	-28.40	.47	20	1	3	2
March ^a	36	-29	-1.30	.21	8	10	9	2
April ^f	42	-24	13.08	.75	15	6	8	2
May ^a	75	11	41.20	.60	16	.....	11	3
June ^g	81	34	57.50	2.24	14	9	2	6
July ^a	80	35	60.64	3.25	20	6	1	.....
August ^e	73	18	50.80	1.02	15	4	5	6

^a Record for 27 days.^d Record for first 13 days.^f Record for 29 days.^b Record for 28 days.^e Record for 24 days.^g Record for 25 days.^c Record for 30 days.

MILLER HOUSE, near Circle. J. F. Kelly, observer.

1909.								
September		3	.....	0.20	16	3	11	1
October		-12	.....	.63	10	1	20	.....

FORT YUKON: Lat. $66^{\circ} 30'$, long. $145^{\circ} 15'$. F. G. Langdon, observer.

1909.								
January	12	-64	-38.75	.....	24	.....	7	1
February	5	-54	-26.00	.....	22	.....	6	.....
March	34	-32	2.80	.....	20	.....	11	.....
April	49	-24	15.80	.....	18	3	9	.....
May	68	18	42.40	.....	17	6	8	.....
June	77	36	57.40	.....	13	6	11	.....
July	83	42	60.30	.....	15	3	13	.....
August	76	30	50.45	.....	16	3	12	.....

FAIRBANKS: Lat. $64^{\circ} 50'$, long. $148^{\circ} 9'$. Isabel M. Embery, observer.

1908.								
October	51	-21	21.73	0.47	18	5	8	5
November	46	-30	6.91	.51	15	6	9	2
December	33	-48	- .95	.75	6	2	13	7
1909.								
January	25	-54	-26.64	.90	23	.....	8	6
February	45	-45	-19.67	.08	21	.....	8	1
March	43	-21	10.25	.05	22	6	3	2
April	54	-8	24.20	.66	21	5	4	4
May	74	26	47.09	.38	18	10	3	4
June	77	35	57.40	1.64	13	16	1	11
July	82	42	60.80	1.90	13	17	1	16
August	76	28	54.71	1.78	17	10	4	12
September	74	11	41.39	3.90	16	.....	14	7
October	49	-10	21.36	.75	17	1	12	0

CHATANIKA RIVER, near Fairbanks. G. M. Sabene, observer.

1908.								
August				0.99	14	6	11	12
September				2.45	13	8	9	11
October				.75	25	.....	6	6
November				.35	18	.....	12	3
December				.61	17	.....	14	6
1909.								
February				.09	17	.....	11	3
March				.03	10	1	20	1

*Condensed meteorological reports—Continued.*HOT SPRINGS: Lat. $64^{\circ} 55'$, long. $150^{\circ} 45'$. V. L. Bevington, observer.

Month.	Temperature.			Total precipitation.	Weather conditions (number of days).			
	Maxi- mum.	Mini- mum.	Daily mean.		Clear.	Partly cloudy.	Cloudy.	Rain or snow.
1908.								
October				.41				
November				.20				
December				.62				
1909.								
January				.31				
February				.38				
March				.27				
April				.35				
May				.78				
June				1.65				
July	89	37	63.50	1.76				
August	85	29	57.30	3.19				
September	76	8	41.80	.25				
October	51	-10	20.75	4.55				

ALLAKAKET: Lat. $66^{\circ} 45'$, long. $151^{\circ} 10'$. Clara M. Carter, observer.

1908.								
September	61	-3.1	32.46	1.45	10	8	12	12
October	36.5	-35	10.50	.98	8	11	12	9
November	28.8	-47	-6.57	.78	10	5	15	12
December	27.2	-58.2	-6.70	1.85	9	.....	22	21
1909.								
January	27	-63.9	-38.08	.11	24	.....	7	3
February	9	-57.2	-24.60	.12	23	.....	5	4
March	33	-41.2	-5.62	.63	17	4	10	10
April	42	-26.1	11.70	.46	13	9	8	6
May	70.8	15.2	40.60	.41	14	15	2	3
June	76.5	34.2	55.60	2.81	5	16	9	17
July	83.5	35	59.50	1.35	11	19	1	14
August	78.2	24	50.40	.92	16	7	8	6

FORT GIBBON: Lat. $65^{\circ} 8'$, long. 152° . Chas. B. Murphy, observer.

1908.								
October	42	-12	18.53	0.45	14	6	11	5
November	31	-25	4.96	.08	13	.....	17	2
December	18	-46	.06	.60	12	7	12	4
1909.								
January	28	-48	-20.20	.05	17	2	12	1
February	8	-42	-12.44	.10	25	.....	3	1
March	36	-36	2.10	.37	17	3	11	4

HOLY CROSS MISSION: Lat. $62^{\circ} 20'$, long. $159^{\circ} 50'$. Brother Constantine, observer.

1908.								
September	54	21	38.00	2.68	9	6	15	8
October	47	-2	25.58	2.01	6	21	4	4
November	58	-16	8.56	2.44	10	6	14	7
December ^a								
1909.								
January	25	-42	-9.66	.....	19	1	11	.....
February	30	-36	-4.01	.....	20	1	7	1
March	32	-39	1.90	.....	15	5	11	.....
April	53	-23	25.10	.....	6	7	17	2
May	69	27	43.34	.....	9	6	16	.....

^a No record.

Condensed meteorological reports—Continued.

CANDLE: Lat. 66° , long. $161^{\circ} 50'$. Ward Estey, observer.

Month.	Temperature.			Total precipitation.	Weather conditions (number of days).			
	Maximum.	Minimum.	Daily mean.		Clear.	Partly cloudy.	Cloudy.	Rain or snow.
1908.								
October ^a	27	-24	9.50	.....	9	.....	.....	.....
November ^b	30	-32	2.43	.....	15	.....	14	.....
December ^c	34	-30	6.43	.....	3	.....	27	.....
1909.								
January ^c	30	-45	-9.24	.....	11	.....	19	.....
February.....	16	-40	7.69	.....	10	.....	18	.....
March.....	15	-44	-12.83	.....	13	.....	18	.....
April.....	45	-23	14.95	0.17	15	.....	15	2
May.....	57	13	33.90	.07	21	.....	10	1
June.....	67	27	44.80	.84	23	3	4	10
July.....	81	32	53.80	.83	22	5	4	6
August.....	76	27	49.80	.83	22	3	6	4

^a Record for 9 days.^b Record for 29 days.^c Record for 30 days.SOLOMON: Lat. $64^{\circ} 33'$, long. $164^{\circ} 24'$. J. P. Samuelson, observer.

1908.								
November.....	34	-14	10.25	.....	13	11	6	.....
December ^a	38	-8	19.70	.....	2	9	9	.....

^a Record for 20 days.ORO TINO: Lat. $64^{\circ} 24'$, long. $164^{\circ} 26'$. J. R. Samuelson, observer.

1909.								
January.....	32	-30	-2.98	.....	21	7	3	.....
February.....	22	-28	-10.39	.....	19	4	5	.....
March.....	18	-34	-11.73	.....	23	5	3	.....

BLACK POINT: Lat. $64^{\circ} 51'$, long. $165^{\circ} 15'$. F. F. Miller, observer.

1909.								
June.....	.....	.....	.....	1.06	13	5	12	7
July.....	.....	.....	.....	.64	18	5	8	8
August.....	.....	.....	.....	1.87	10	10	11	9
September ^a.....	.....	.....	.....	.72	7	9	4	6

^a Record for 21 days.DAHL: Lat. $65^{\circ} 22'$, long. $164^{\circ} 41'$. John A. White, observer.

1909.								
August.....	94	29	51.90	1.11	5	8	18	5
September.....	76	9	36.80	.09	3	12	13	3

NOME: Lat. $64^{\circ} 30'$, long. $165^{\circ} 24'$. A. A. Gibson, observer.

1908.								
October.....	45	1	26.07	1.13	10	2	19	8
November.....	31	-13	9.78	.26	9	5	16	4
December.....	35	-18	14.43	.75	6	1	24	6
1909.								
January.....	30	-28	-32	.37	20	1	10	3
February.....	21	-26	1.36	.13	16	5	7	2
March.....	25	-33	-2.56	.21	22	4	5	2
April.....	40	-11	19.60	.45	7	7	16	5
May.....	54	20	34.93	.15	11	5	15	2
June.....	57	28	42.30	.88	13	5	12	5
July.....	70	34	52.50	.82	16	5	10	8
August.....	70	36	50.40	1.66	8	6	17	9
September.....	61	20	40.30	.96	13	7	10	10

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